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Test Report Number:	**TRB41002, Rev. A**
Report Type:	**Full Compliance Immunity**
Reference Standard:	**Hart InterCivic EMI/EMC Test Plan**
Date of Report:	**25 November 2014**
Product Name:	**Verity Touch Writer**
Model Number:	**2005352 (Touch Writer) Rev. B, 2005358 (Standard Booth), 2005359 (Accessible Booth)**
Serial Number:	**W1400006609**
Manufacturer:	**Hart InterCivic**
Representative:	**Darrick Forester (SLI Global)**
Approved By:	

Prepared for:

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Denver, Colorado 80202
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Report Prepared by:

Mary Burback
Office Manager

Report Approved by:

Vincent Greb
Laboratory Manager

Revision	Description of Revision	Date:
Rev. -	Initial Release	18 November 2014
Rev. A	Changes per client email of 11/21/2014	25 November 2014

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LIST OF APPENDICES

1.0 TEST SUMMARY

1.1 Product Description

The unit under test (UUT) was the Verity Touch Writer. This product consisted of three components and the model numbers of these components are as follows: 2005352 (Touch Writer) Rev. B, 2005358 (Standard Booth), 2005359 (Accessible Booth). The serial number of the touch writer unit was W1400006609. It is manufactured by Hart InterCivic located in Austin, Texas. This product is a polling place ballot marking device designed for use in commercial and business environments.. The product was continually exercised during testing, as documented in the "configuration" field of the test data sheet.

Additional product information may be found in Appendix H of this report.

1.2 Immunity Test Standards Used

This product was tested in accordance with the Hart InterCivic EMI/EMC Test Plan. This document referenced the immunity test levels defined by the Voting System Guidelines, and the basic test methods outlined in Table 1-1. A copy of this document may be found in Appendix H of this report.

Table 1-1

Specification	Test Method	Performance Criteria
Electrostatic Discharge	IEC 61000-4-2, Ed. 2.0 (2008-12)	(B) Self-Recovering
Radiated RF Immunity	IEC 61000-4-3, Ed. 3.0 (2006-02) + A1 (2007-11) + A2 (2010-03)	(A) No Degradation
Electrical Fast Transient/Burst	IEC 61000-4-4, Ed. 2.0 (2004-07)	(B) Self-Recovering
Surge Immunity	IEC 61000-4-5, Ed. 2.0 (2005-11)	(B) Self-Recovering
Conducted RF Immunity	IEC 61000-4-6, Ed. 3.0 (2008-10)	(A) No Degradation
Power Frequency H-field Immunity	IEC 61000-4-8, Ed. 2.0 (2009-09)	(A) No Degradation
Voltage Dips, Interrupts	IEC 61000-4-11, Ed. 2.0 (2004-03)	(B) Self-Recovering (C) User-intervention Allowed

1.3 Test Results

The UUT **complied** with all the immunity requirements defined by the Hart InterCivic EMI/EMC Test Plan. Test results are summarized in Table 1-2.

Table 1-2

Specification	Test Method	Test Conditions	Compliance
Electrostatic Discharge	IEC 61000-4-2	± 8 kV Contact / HCP, VCP / ± 15 kV Air	Compliant
Radiated RF Immunity	IEC 61000-4-3	80 - 1000 MHz, 10 V/m, 80% 1 kHz AM	Compliant
EFT/Burst	IEC 61000-4-4	± 1.0 kV I/O, ± 2.0 kV AC mains	Compliant
Surge Immunity	IEC 61000-4-5	AC Mains: 1.2/50 us @ ± 2 kV common mode, ± 1 kV differential mode	Compliant
Conducted RF Immunity	IEC 61000-4-6	150 kHz to 80 MHz, 10 Vrms, 80% 1 kHz AM, AC input and I/O	Compliant
Power Frequency H-field Immunity	IEC 61000-4-8	30 A/m, 50/60 Hz, 3 axes	Compliant
Voltage Dips and Interrupts	IEC 61000-4-11	>95% reduction for 0.5 cycles, 30% reduction for 25 cycles, >95% reduction for 250 cycles Nominal increase of 7.5%; nominal decrease of 12.5% 15% line variations	Compliant

1.4 Modifications Required for Compliance

The modifications outlined in Table 1-3 were required for compliance with the electrical fast transient test. Further documentation regarding these changes may be found in the EMI Test Log in Appendix I of this report.

Table 1-3

Test	Description of Modification
Electrical Fast Transient	Electrical tape on usb cable
	Wrap 3-sides of power brick with lexan label – material is correct, color of label is being worked on Install new back plate with clear lexan label

2.0 SCOPE

2.1 Purpose

This report documents the test efforts performed on the Verity Touch Writer to verify compliance to the 2010 version of the Hart InterCivic EMI/EMC Test Plan. This was a formal acceptance test and was conducted on selected days over the period from 1 through 23 October 2014.

2.2 Test Plan

Testing was performed in accordance with the Hart InterCivice EMI/EMC Test Plan. This document defines the critical operational parameters for testing, as well as providing general product information. This is contained in Appendix H of this report.

2.3 Test Parameters

For RF immunity testing, the UUT was placed in a completely anechoic lined chamber (CALC). Support equipment was placed outside the CALC and I/O to the UUT was connected through a penetration panel.

Critical parameters of this product, which were monitored during testing, were defined by the client in their EMI/EMC Test Plan, contained in Appendix H of this report.

2.4 Definition of Performance Criterion for the UUT

The performance criteria for this product are defined in the Hart InterCivic EMI/EMC Test Plan, contained in Appendix H of this report.

3.0 TEST ENVIRONMENT

3.1 Immunity Test Site

The immunity testing was performed at EMCI's test facility in Longmont, Colorado. The radiated field immunity testing was performed in a ferrite lined, shielded enclosure. The enclosure is 10' high x 12' wide x 20' long in size and meets the field uniformity requirements of IEC 61000-4-3. The size of the chamber allows 2-meter separation between the antenna and the UUT.

All other immunity testing was performed on a ground plane measuring approximately 3.0 meters by 4.5 meters (13.5 m^2) and made of 0.125" thick aluminum. The ground plane extended beyond the UUT by 0.5 meters on all sides, was bonded to the facility ground and configured in accordance with the applicable standards.

3.2 Measurement Uncertainty

The measurement uncertainty for EMC Integrity's emissions test facility complies with the requirements defined in CISPR 16. The complete calculations of EMC Integrity's measurement uncertainty is contained in an EMCI memo, which is available upon request. However, a summary of EMCI's measurement uncertainty is given in Table 3-1.

Table 3-1

Test	Measurement Uncertainty	Reference
Electrostatic Discharge	Contact Voltage: 1.9% Risetime: 60 ps Peak Current: 2.8% 30 ns Current: 3.8% 60 ns Current: 9% Indicated Voltage: 1.9%	Accredited Calibration Data Sheet
Radiated RF Immunity	V-pole: 1.2 dB H-pole: 0.7 dB	Worksheets located at H:\EMCI\Administration\Calibration\Measurement Uncertainty
Electrical Fast Transient	Voltage: 0.01 kV Risetime: 0.45 nsec Pulse Width: 1.08 nsec	
Surge Immunity	O.C. Voltage: 0.01 kV Risetime: 0.1 usec Pulse Width: 1.76 usec S. C. Current: 0.91 A Risetime: 0.08 usec Pulse Width: 0.15 usec	
Conducted RF Immunity	0.24 dB	
Power Frequency H-field Immunity	0.87 dB	
Voltage Dips & Interruptions	Voltage: 10.38 Volts Duration: 0.23 msec	

4.0 IEC 61000-4-2, Electrostatic Discharge

4.1 Summary of Test Results

Electrostatic discharge (ESD) testing was performed on the UUT in accordance with the test methods specified by IEC 61000-4-2. Contact discharge was performed at levels of ± 2 kV, ± 4 kV and ± 8 kV at applicable (conductive) test points. Air discharge was performed for non-conductive surfaces of the product at levels of ±2 kV, ± 4 kV, ± 8 kV and ± 15 kV. Indirect discharge to the horizontal coupling plane (HCP) and the vertical coupling plane (VCP) were also performed to levels of ± 2 kV, ± 4 kV and ± 8 kV.

Note: In the event that no discharge occurs when ESD testing is performed on a product, the data sheet will state "no [contact or air] discharge points found".

The UUT complied with the requirements of this test.

4.2 Test Setup

The UUT was set up per IEC 61000-4-2 and tested to the levels specified in the Hart InterCivic EMI/EMC Test Plan.

4.3 Special Configurations

N/A

4.4 Performance Criteria

Performance criterion Level B is defined as degradation in performance provided 1) the UUT self-recovers without user-intervention and 2) no data is lost.

4.5 Deviations from Test Procedures

N/a

4.6 Test Data

See APPENDIX A for data sheets, discharge points and test setup pictures.

4.7 Temperature and Humidity

Temperature, relative humidity and barometric pressure are located in the header table for the IEC 61000-4-2 test data sheet.

5.0 IEC 61000-4-3, Radiated RF Immunity

5.1 Summary of Test Results

Radiated RF immunity testing was performed on the UUT in accordance with the test methods specified by IEC 61000-4-3. The UUT was placed on a non-conductive table, 80 cm above the ferrite floor of the completely anechoic-lined chamber. The frequency range for this testing was 80 - 1000 MHz. The UUT was placed 2 meters from the radiating antenna; which was 1.5 meters above the floor of the chamber. Testing was performed in both horizontal and vertical antenna polarizations. The frequency was incremented in 1% steps, with a 3 second dwell time for each test frequency. The UUT was rotated on the table so that all four sides were illuminated in the 10 V/m field. The field was amplitude modulated with a 1 kHz sine wave to a depth of 80%. Performance of the unit was monitored remotely with the support PC, located outside the CALC.

The UUT complied with the requirements of this test.

5.2 Test Setup

The UUT was set up per IEC 61000-4-3 and tested to the levels specified in the Hart InterCivic EMI/EMC Test Plan.

5.3 Special Configurations

N/A

5.4 Performance Criteria

Performance criterion Level A is defined as no degradation in performance beyond manufacturer's specified tolerances.

5.5 Deviations from Test Procedures

N/a

5.6 Test Data

See APPENDIX B for data sheets and test setup pictures.

5.7 Temperature and Humidity

Temperature, relative humidity and barometric pressure are located in the header table for the IEC 61000-4-3 test data sheet.

6.0 IEC 61000-4-4, Electrical Fast Transient/Burst

6.1 Summary of Test Results

Electrical fast transient/burst immunity testing was performed on the UUT in accordance with the test methods specified by IEC 61000-4-4. The UUT AC power was tested via direct injection at a level of ± 2 kV. External I/O in excess of 3 meters was tested via capacitive coupling clamp to a level of ± 1.0 kV.

The UUT complied with the requirements of this test.

6.2 Test Setup

The UUT was set up per IEC 61000-4-4 and tested to the levels per the Hart InterCivic EMI/EMC Test Plan.

6.3 Special Configurations

N/A

6.4 Performance Criteria

Performance criterion Level B is defined as degradation in performance provided 1) the UUT self-recovers without user-intervention and 2) no data is lost.

6.5 Deviations from Test Procedures

N/a.

6.6 Test Data

See APPENDIX C for data sheet and test setup pictures.

6.7 Temperature and Humidity

Temperature, relative humidity and barometric pressure are located in the header table for the IEC 61000-4-4 test data sheet.

7.0 IEC 61000-4-5, Surge Immunity

7.1 Summary of Test Results

Surge immunity testing was performed on the UUT in accordance with the test methods specified by IEC 61000-4-5. The UUT AC power was tested via direct injection at levels of ±0.5 kV and ±1.0 kV for differential mode and at levels of ±0.5 kV, ±1.0 kV and ±2.0 kV for common mode. Surges were injected at 0 degrees, 90 degrees, 180 degrees and 270 degrees of the input AC waveform at a rate of one pulse per minute. Five pulses were injected for each test configuration.

The UUT complied with the requirements of this test.

7.2 Test Setup

The UUT was set up per IEC 61000-4-5 and tested to the levels specified in the Hart InterCivic EMI/EMC Test Plan.

7.3 Special Configurations

N/A

7.4 Performance Criteria

Performance criterion Level B is defined as degradation in performance provided 1) the UUT self-recovers without user-intervention and 2) no data is lost.

7.5 Deviations from Test Procedures

N/A

7.6 Test Data

See APPENDIX D for data sheets and test setup pictures.

7.7 Temperature and Humidity

Temperature, relative humidity and barometric pressure are located in the header table for the IEC 61000-4-5 test data sheet.

8.0 IEC 61000-4-6, Conducted RF Immunity

8.1 Summary of Test Results

Conducted RF immunity testing was performed on the UUT in accordance with the test methods specified by IEC 61000-4-6. The UUT was subjected to injected RF signals on its input AC power cable. Injection on the AC leads was performed via a coupling/decoupling network (CDN). Injection on the I/O of the product was performed with an EM clamp. The frequency range for this testing was 150 kHz to 80 MHz. The test frequency was stepped in 1% increments with a three second dwell time for each injection frequency. The injection level used for all testing was 10 Vrms with 1 kHz AM to a depth of 80%.

The UUT complied with the requirements of this test.

8.2 Test Setup

The UUT was set up per IEC 61000-4-6 and tested to the levels specified in the Hart InterCivic EMI/EMC Test Plan.

8.3 Special Configurations

N/A

8.4 Performance Criteria

Performance criterion Level A is defined as no degradation in performance beyond manufacturer's specified tolerances.

8.5 Deviations from Test Procedures

N/A

8.6 Test Data

See APPENDIX E for data sheets and test setup pictures.

8.7 Temperature and Humidity

Temperature, relative humidity and barometric pressure are located in the header table for the IEC 61000-4-6 test data sheet.

9.0 IEC 61000-4-8, Power Frequency H-field Immunity

9.1 Summary of Test Results

Power frequency H-field immunity testing was performed on the UUT in accordance with the test methods specified by IEC 61000-4-8. The UUT was exposed to a 30 A/m field at both 50 and 60 Hz. All three axes (x, y, and z) were immersed in the field for a period of 60 seconds for each configuration. A 1.5 meter by 2.0 meter coil was used for this test and the immersion method was used.

The UUT complied with the requirements of this test.

9.2 Test Setup

The UUT was set up per IEC 61000-4-8 and tested to the levels specified in the Hart InterCivic EMI/EMC Test Plan.

9.3 Special Configurations

N/A

9.4 Performance Criteria

Performance criterion Level A is defined as no degradation in performance beyond manufacturer's specified tolerances.

9.5 Deviations from Test Procedures

N/A

9.6 Test Data

See APPENDIX F for data sheets and test setup pictures.

9.7 Temperature and Humidity

Temperature, relative humidity and barometric pressure are located in the header table for the IEC 61000-4-8 test data sheet.

10.0 IEC 61000-4-11, Voltage Dips and Interrupts

10.1 Summary of Test Results

Voltage dip and interrupt testing was performed on the UUT in accordance with IEC 61000-4-11. The UUT was subjected to the following voltage fluctuations on its AC power input:

>95% reduction for 5 seconds	variation
30% reduction for 0.5 seconds	dip
>95% reduction for 0.01 seconds	dip
7.5% increase & 12.5% decrease	
15% surges from nominal line	

The UUT complied with the requirements of this test.

10.2 Test Setup

The UUT was set up per IEC 61000-4-11 and tested to the levels specified in the Hart InterCivic EMI/EMC Test Plan.

10.3 Special Configurations

N/A

10.4 Performance Criteria

The performance criteria for this test are Levels B and C. Level B is defined as allowing degraded performance provided that the UUT self-recovers without user intervention and no data is lost. Level C is defined as allowing user intervention to regain functionality of the product provided that no permanent damage occurs.

10.5 Deviations from Test Procedures

N/A

10.6 Test Data

See APPENDIX G for data sheets and test setup pictures.

10.7 Temperature and Humidity

Temperature, relative humidity and barometric pressure are located in the header table for the IEC 61000-4-11 test data sheet.

APPENDIX A

Electrostatic Discharge Test Data

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Electrostatic Discharge per IEC / EN 61000-4-2

Manufacturer:	SLI Global Solutions	Project Number:	B41002
Customer Representative:	Darrick Forester	Test Area:	GP1
Model:	2005352 (Touch Writer) Rev. B	S/N:	W1400007609
Standard Referenced:	IEC 61000-4-2	Date:	October 24, 2014
Temperature:	20.4˚C Humidity: 37%	Pressure:	840 mb
Input Voltage:	120Vac/60Hz		
Configuration of Unit:	Writing to V Drive, Play Audio, Printing to thermal Printer and OKI B431d Printer		
Test Engineer:	Mark Novak		

B41002-4-2.doc FR0100

Test Location	Voltage Level (kV)	Polarity +	Polarity -	Number of Pulses	Pulses Per Second	Comments	Criteria Met	Pass / Fail
Indirect Discharge Points								
VCP	2, 4, 8	x	x	10	1	Front Side	A	Pass
VCP	2, 4, 8	x	x	10	1	Left Side	A	Pass
VCP	2, 4, 8	x	x	10	1	Right Side	A	Pass
VCP	2, 4, 8	x	x	10	1	Back Side	A	Pass
HCP	2, 4, 8	x	x	10	1		A	Pass
Contact Discharge Points - **RED** Arrows.								
Figure A2	2, 4, 8	x	x	---	---	No Contact Discharge Points found	---	---
Figure A3	2, 4, 8	x	x	---	---	No Contact Discharge Points found	---	---
Figure A4	2, 4, 8	x	x	---	---	No Contact Discharge Points found	---	---
Figure A5	2, 4, 8	x	x	---	---	No Contact Discharge Points found	---	---
Figure A6	2, 4, 8	x	x	---	---	No Contact Discharge Points found	---	---
Figure A7	2, 4, 8	x	x	---	---	No Contact Discharge Points found	---	---
Figure A8	2, 4, 8	x	x	---	---	No Contact Discharge Points found	---	---
Air Discharge Points - **BLUE** Arrows.								
Figure A2	2, 4, 8, 15	x	x	10	1	+/-15 kv	A	Pass
Figure A3	2, 4, 8, 15	x	x	10	1	+/-15 kv	A	Pass
Figure A4	2, 4, 8, 15	x	x	10	1	+/-8, 15kv on headphone and button jack. +/-15 on control cable and corner,	A	Pass
Figure A5	2, 4, 8, 15	x	x	10	1	+15 anywhere on the screen, discharged 10 times to each corner. -15kv discharges were intermittent even with wiping the screen +/-15 on LED	A	Pass
Figure A6	2, 4, 8, 15	x	x	10	1	+/-8, 15kV to power connector. +/-15kv to poll worker button, power button and usb	A	Pass
Figure A7	2, 4, 8, 15	---	---	---	---	No discharge points found	---	---
Figure A8	2, 4, 8, 15	x	x	10	1		A	Pass

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Electrostatic Discharge per IEC / EN 61000-4-2

Manufacturer:	SLI Global Solutions	Project Number:	B41002
Customer Representative:	Darrick Forester	Test Area:	GP1
Model:	2005352 (Touch Writer) Rev. B	S/N:	W1400007609
Standard Referenced:	IEC 61000-4-2	Date:	October 24, 2014

B41002-4-2.doc FR0100

Figure A1. Electrostatic Discharge Test Setup.

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Electrostatic Discharge per IEC / EN 61000-4-2

Manufacturer:	SLI Global Solutions	Project Number:	B41002
Customer Representative:	Darrick Forester	Test Area:	GP1
Model:	2005352 (Touch Writer) Rev. B	S/N:	W1400007609
Standard Referenced:	IEC 61000-4-2	Date:	October 24, 2014

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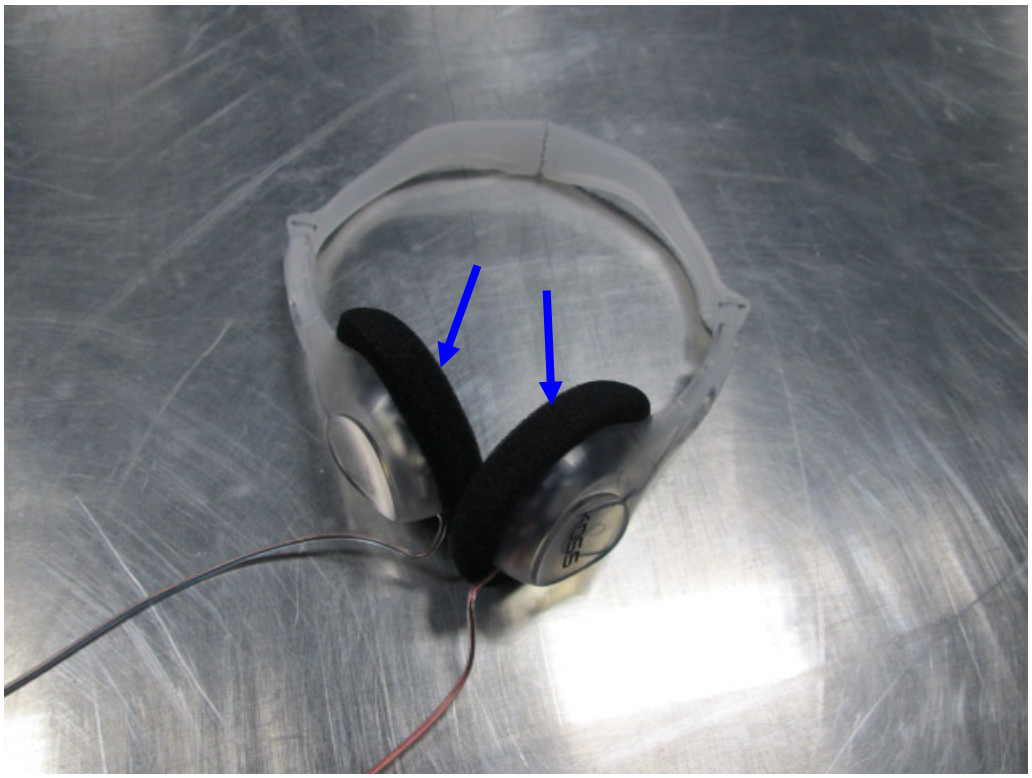

Figure A2. Electrostatic Discharge Test Setup.

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Electrostatic Discharge per IEC / EN 61000-4-2

Manufacturer:	SLI Global Solutions	Project Number:	B41002
Customer Representative:	Darrick Forester	Test Area:	GP1
Model:	2005352 (Touch Writer) Rev. B	S/N:	W1400007609
Standard Referenced:	IEC 61000-4-2	Date:	October 24, 2014

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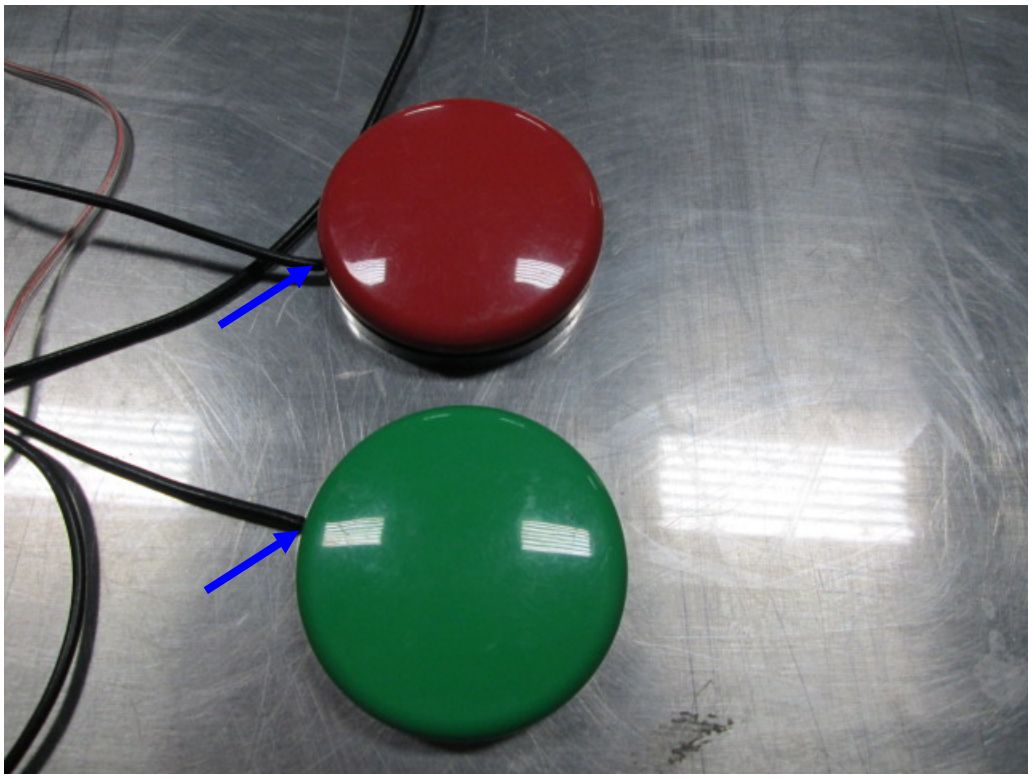

Figure A3. Electrostatic Discharge Test Setup.

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Electrostatic Discharge per IEC / EN 61000-4-2

Manufacturer:	SLI Global Solutions	Project Number:	B41002
Customer Representative:	Darrick Forester	Test Area:	GP1
Model:	2005352 (Touch Writer) Rev. B	S/N:	W1400007609
Standard Referenced:	IEC 61000-4-2	Date:	October 24, 2014

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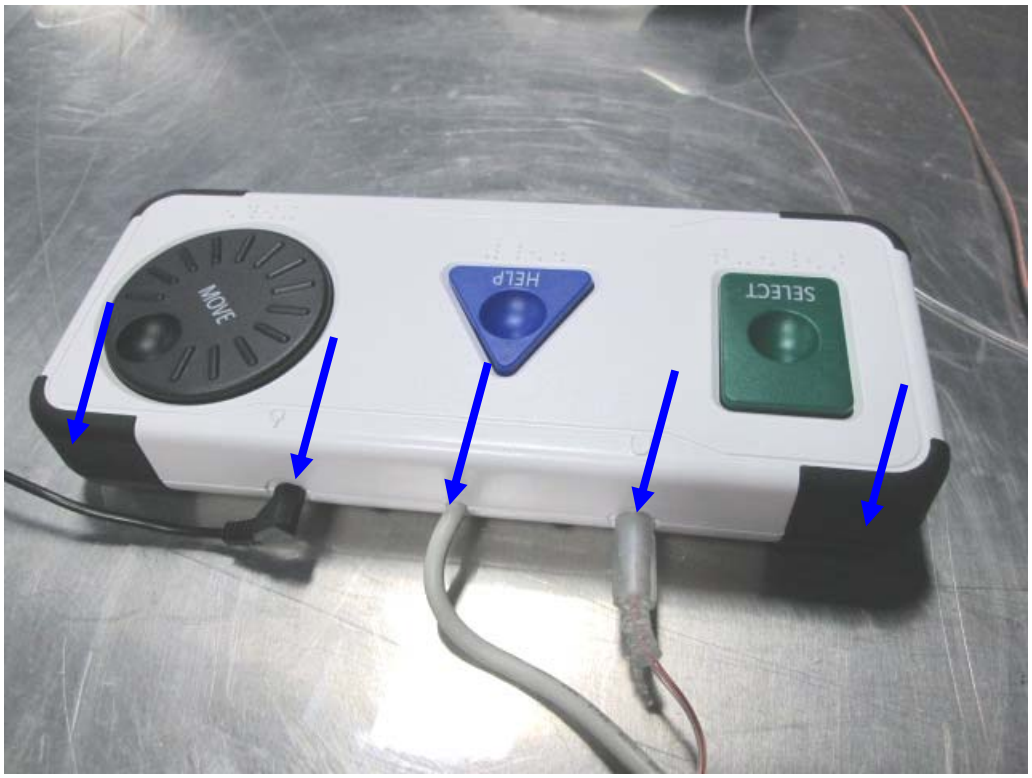

Figure A4. Electrostatic Discharge Test Setup.

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Electrostatic Discharge per IEC / EN 61000-4-2

Manufacturer:	SLI Global Solutions	Project Number:	B41002
Customer Representative:	Darrick Forester	Test Area:	GP1
Model:	2005352 (Touch Writer) Rev. B	S/N:	W1400007609
Standard Referenced:	IEC 61000-4-2	Date:	October 24, 2014

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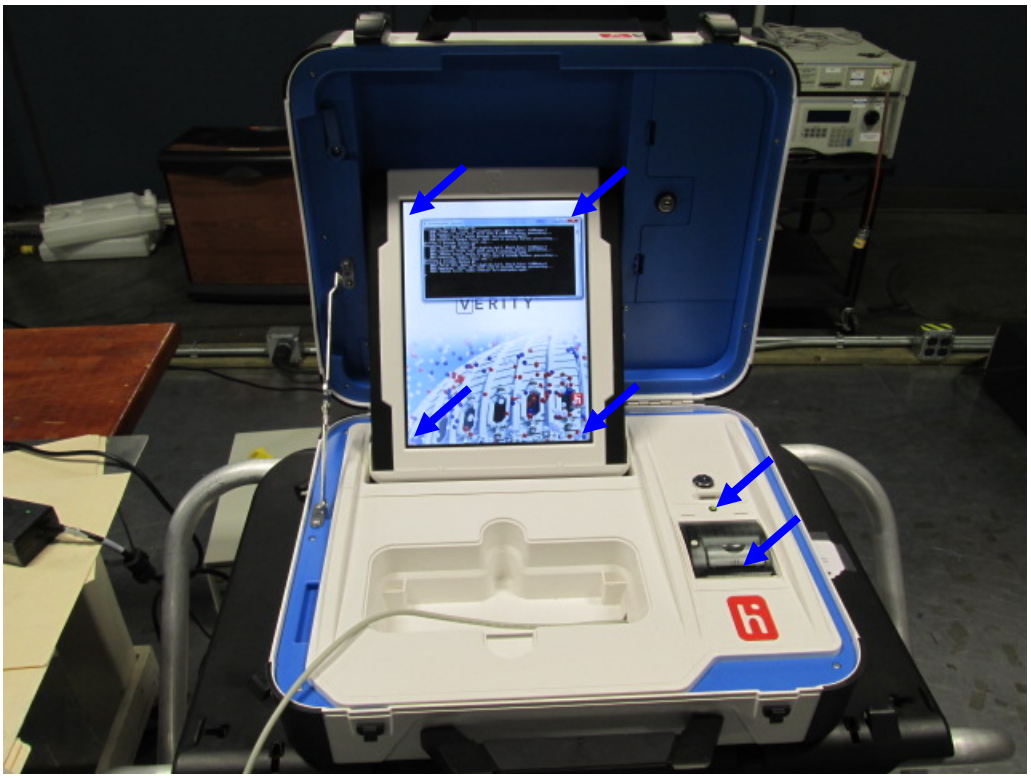

Figure A5. Electrostatic Discharge Test Setup.

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Electrostatic Discharge per IEC / EN 61000-4-2

Manufacturer:	SLI Global Solutions	Project Number:	B41002
Customer Representative:	Darrick Forester	Test Area:	GP1
Model:	2005352 (Touch Writer) Rev. B	S/N:	W1400007609
Standard Referenced:	IEC 61000-4-2	Date:	October 24, 2014

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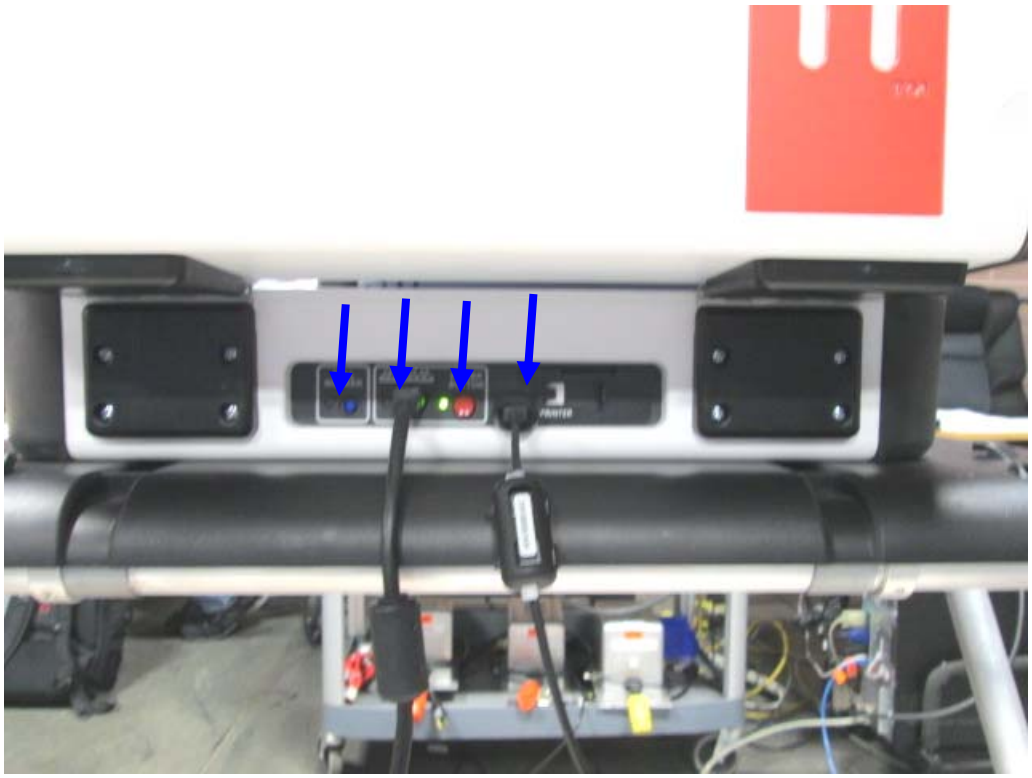

Figure A6. Electrostatic Discharge Test Setup.

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Electrostatic Discharge per IEC / EN 61000-4-2

Manufacturer:	SLI Global Solutions	Project Number:	B41002
Customer Representative:	Darrick Forester	Test Area:	GP1
Model:	2005352 (Touch Writer) Rev. B	S/N:	W1400007609
Standard Referenced:	IEC 61000-4-2	Date:	October 24, 2014

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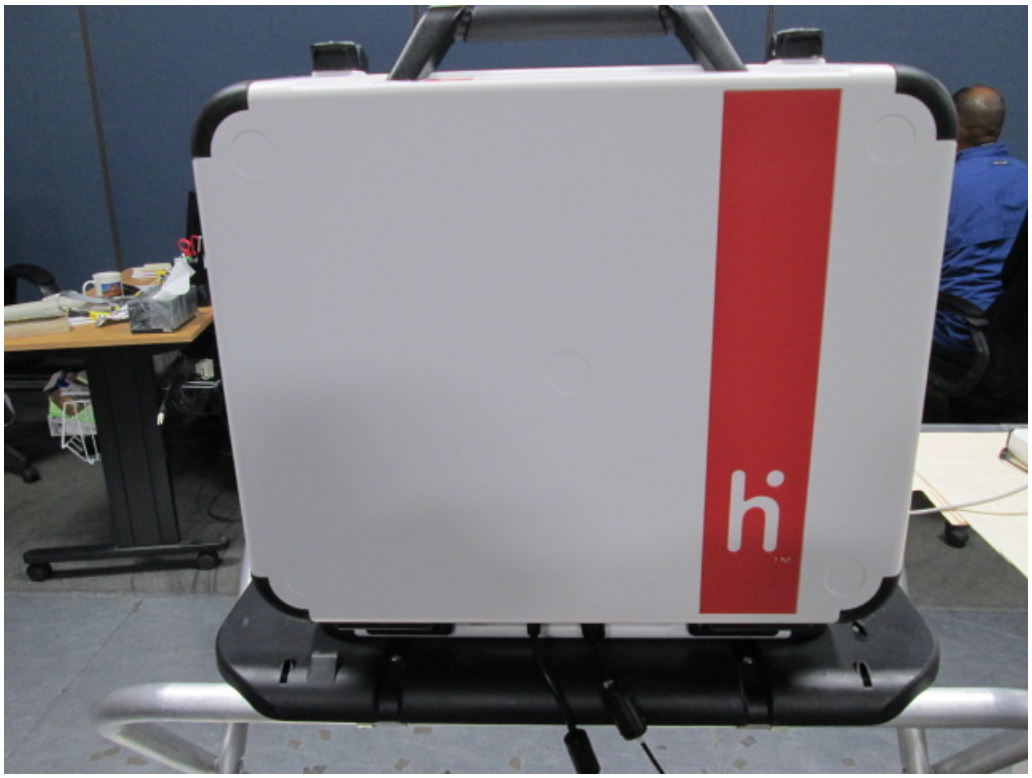

Figure A7. Electrostatic Discharge Test Setup.

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Electrostatic Discharge per IEC / EN 61000-4-2

Manufacturer:	SLI Global Solutions	Project Number:	B41002
Customer Representative:	Darrick Forester	Test Area:	GP1
Model:	2005352 (Touch Writer) Rev. B	S/N:	W1400007609
Standard Referenced:	IEC 61000-4-2	Date:	October 24, 2014

B41002-4-2.doc FR0100

Figure A8. Electrostatic Discharge Test Setup.

Electrostatic Discharge per IEC / EN 61000-4-2

Manufacturer:	SLI Global Solutions	Project Number:	B41002
Customer Representative:	Darrick Forester	Test Area:	GP1
Model:	2005352 (Touch Writer) Rev. B	S/N:	W1400007609
Standard Referenced:	IEC 61000-4-2	Date:	October 24, 2014

B41002-4-2.doc FR0100

Test Equipment List

ID Number	Manufacturer	Model #	Serial #	Description	Cal Date	Cal Due
1015	KeyTek	MZ-15/EC	0010280/00102 79	Mini Zap ESD Gun	09/18/2014	09/18/2015
1333	EMC Partner	ESD3000	395	ESD Test System	03/06/2014	03/06/2015
1549	California Instruments/A metek	1251P	1423A05348	AC power supply	NA	NA
1552	EXTECH Instruments	445715		Hygro-Thermometer	09/29/2014	09/29/2015

APPENDIX B

Radiated RF Immunity Test Data

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Radiated RF Immunity per IEC / EN 61000-4-3

Manufacturer:	SLI Global Solutions	Project Number:	B41002
Customer Representative:	Darrick Forester	Test Area:	CALC
Model:	2005352 (Touch Writer) Rev. B	S/N:	W1400006609 (UUT) AK46022060A0 (Printer) AK46022066A0 (Replacement printer)
Standard Referenced:	IEC 61000-4-3	Date:	October 1, 2014
Temperature:	24.6˚C Humidity: 34%	Pressure:	839 mb
Input Voltage:	120Vac/60Hz		
Configuration of Unit:	Writing to V Drive, Play Audio, Printing to thermal Printer and OKI B431d Printer		
Test Engineer:	Casey Lockhart		

B41002-4-3.doc FR0100

Frequency (MHz)	Modulation				Step Size (%)	Field (V/m)	Polarity (V or H)	Dwell (sec)	Comments	Criteria Met	Pass / Fail
	Type	%	Freq	Form							
80 - 1000	AM	80	1kHz	Sine	1	10	V	3	Front Error code 923 on Printer display Around 474.	C	Fail
400 - 1000	AM	80	1kHz	Sine	1	10	V	3		A	Pass
80 - 1000	AM	80	1kHz	Sine	1	10	H	3		A	Pass
80 - 1000	AM	80	1kHz	Sine	1	10	V	3	**Righ**t Error code 923 on printer, last minutes of test run. Found paper jam.	B	Fail
499 - 1000	AM	80	1kHz	Sine	1	10	V	3		A	Pass
80 - 1000	AM	80	1kHz	Sine	1	10	H	3		A	Pass
80 - 1000	AM	80	1kHz	Sine	1	10	V	3	**Back**	A	Pass
80 - 1000	AM	80	1kHz	Sine	1	10	H	3		A	Pass
80 - 1000	AM	80	1kHz	Sine	1	10	V	3	**Left**	A	Pass
80 - 1000	AM	80	1kHz	Sine	1	10	H	3		A	Pass

emc integrity incorporated

Radiated RF Immunity per IEC / EN 61000-4-3

Manufacturer:	SLI Global Solutions	Project Number:	B41002
Customer Representative:	Darrick Forester	Test Area:	CALC
Model:	2005352 (Touch Writer) Rev. B	S/N:	W1400006609
Standard Referenced:	IEC 61000-4-3	Date:	October 1, 2014

B41002-4-3.doc FR0100

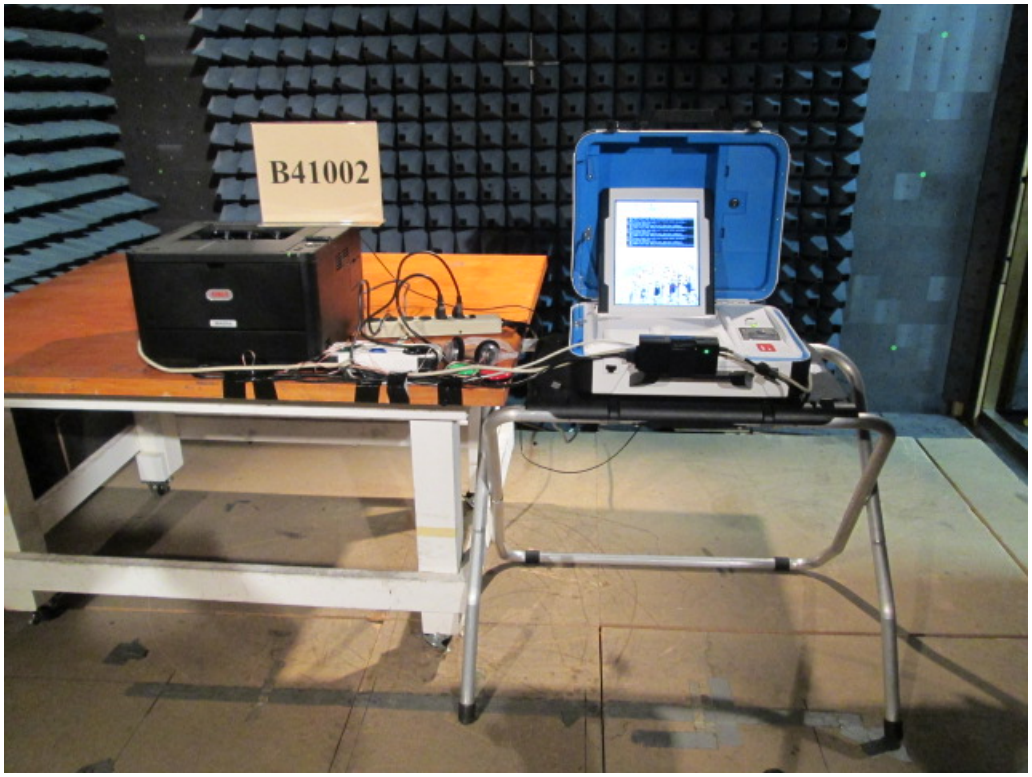

Figure B1. Radiated RF Immunity Test Setup – Front Side.

Radiated RF Immunity per IEC / EN 61000-4-3

Manufacturer:	SLI Global Solutions	Project Number:	B41002
Customer Representative:	Darrick Forester	Test Area:	CALC
Model:	2005352 (Touch Writer) Rev. B	S/N:	W1400006609
Standard Referenced:	IEC 61000-4-3	Date:	October 1, 2014

B41002-4-3.doc FR0100

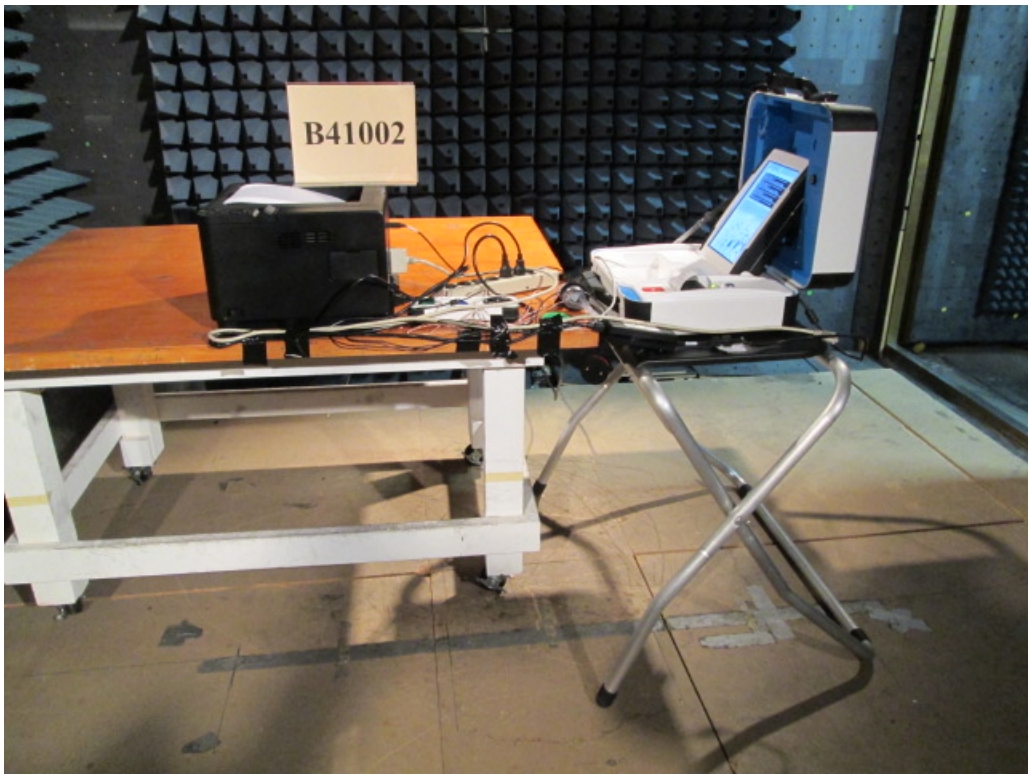

Figure B2. Radiated RF Immunity Test Setup – Right Side.

emc integrity incorporated

Radiated RF Immunity per IEC / EN 61000-4-3

Manufacturer:	SLI Global Solutions	Project Number:	B41002
Customer Representative:	Darrick Forester	Test Area:	CALC
Model:	2005352 (Touch Writer) Rev. B	S/N:	W1400006609
Standard Referenced:	IEC 61000-4-3	Date:	October 1, 2014

B41002-4-3.doc FR0100

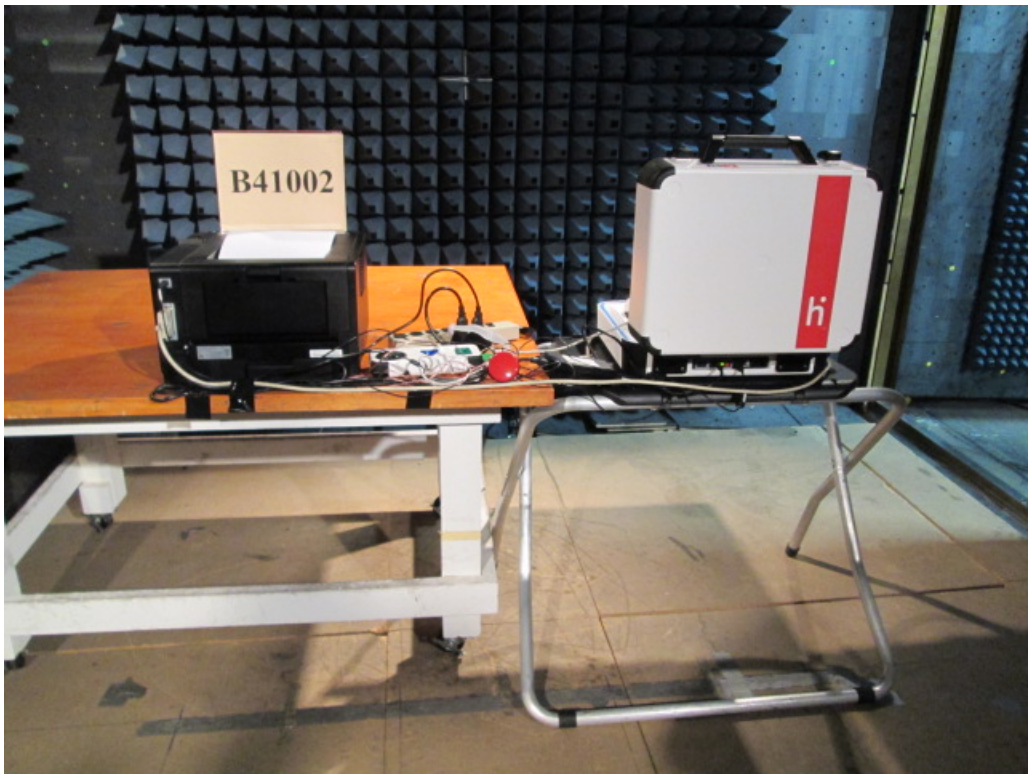

Figure B3. Radiated RF Immunity Test Setup – Back Side.

emc integrity incorporated

Radiated RF Immunity per IEC / EN 61000-4-3

Manufacturer:	SLI Global Solutions	Project Number:	B41002
Customer Representative:	Darrick Forester	Test Area:	CALC
Model:	2005352 (Touch Writer) Rev. B	S/N:	W1400006609
Standard Referenced:	IEC 61000-4-3	Date:	October 1, 2014

B41002-4-3.doc FR0100

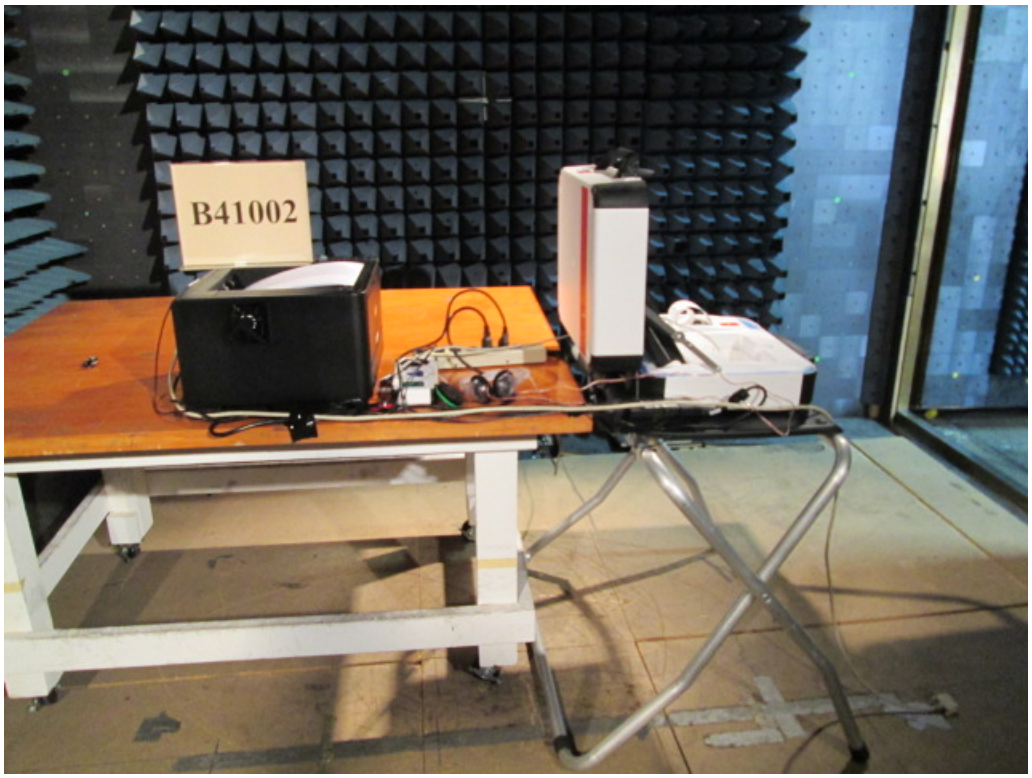

Figure B4. Radiated RF Immunity Test Setup – Left Side.

emc integrity incorporated

Radiated RF Immunity per IEC / EN 61000-4-3

Manufacturer:	SLI Global Solutions	Project Number:	B41002
Customer Representative:	Darrick Forester	Test Area:	CALC
Model:	2005352 (Touch Writer) Rev. B	S/N:	W1400006609
Standard Referenced:	IEC 61000-4-3	Date:	October 1, 2014

B41002-4-3.doc FR0100

Test Equipment List

ID Number	Manufacturer	Model #	Serial #	Description	Cal Date	Cal Due
1005	EMCO	3140	1012	Biconilog Antenna	NA	NA
1058	Ray Proof	RF Shield Room	6698	Completely Anechoic Lined Chamber	07/13/2014	07/13/2015
1139	Wiltron	68369B	675016	Synthesized Signal Generator, 10 MHz - 40 GHz	07/30/2014	07/30/2015
1181	EMCI	RFS	NA	Initial Release 02 July 2004	NA	NA
1455	Giga-tronics	GT-8888A	8888A03337	10 MHz to 8 GHz, +20 dBm, 25 Vdc Power Meter	05/13/2014	05/13/2015
1456	Werlatone	C3908-10	98095	1500 Watts, 50 dB Dual Directional Coupler 80 MHz	05/29/2014	05/29/2015
1478	Ophir	5127F	1100	RF Amplifier, 200 Watt, 20 - 1000 MHz	NA	NA
1537	Extech Instuments	445715	Z315813	Hygro-Thermometer	03/21/2014	03/21/2015

APPENDIX C

Electrical Fast Transients/Burst Test Data

emc integrity incorporated

Electrical Fast Transient/Burst per IEC / EN 61000-4-4

Manufacturer:	SLI Global Solutions	Project Number:	B41002
Customer Representative:	Darrick Forester	Test Area:	GP1
Model:	2005352 (Touch Writer) Rev. B	S/N:	W1400007609
Standard Referenced:	IEC 61000-4-4	Date:	October 23, 2014
Temperature:	20.4˚C Humidity: 38%	Pressure:	840 mb
Input Voltage:	120Vac/60Hz		
Configuration of Unit:	Writing to V Drive, Play Audio, Printing to thermal Printer and OKI B431d Printer		
Test Engineer:	Mark Novak		

B41002-4-4.doc FR0100

Voltage (kV)	Polarity +	Polarity -	Time (sec)	Injection Type	L 1	L 2	L 3	N	P E	Comments	Criteria Met	Pass / Fail
2.0	x		60	CDN	x	x			x	AC **Note: 100 kHz rep rate.**	A	Pass
2.0		x	60	CDN	x	x			x	Printer stopped, had to be restarted. All data was intact on the Touch Writer	A	Pass
										Per standard, this is the only configuration being run for EFT		

emc integrity incorporated

Electrical Fast Transient/Burst per IEC / EN 61000-4-4

Manufacturer:	SLI Global Solutions	Project Number:	B41002
Customer Representative:	Darrick Forester	Test Area:	GP1
Model:	2005352 (Touch Writer) Rev. B	S/N:	W1400007609
Standard Referenced:	IEC 61000-4-4	Date:	October 23, 2014

B41002-4-4.doc FR0100

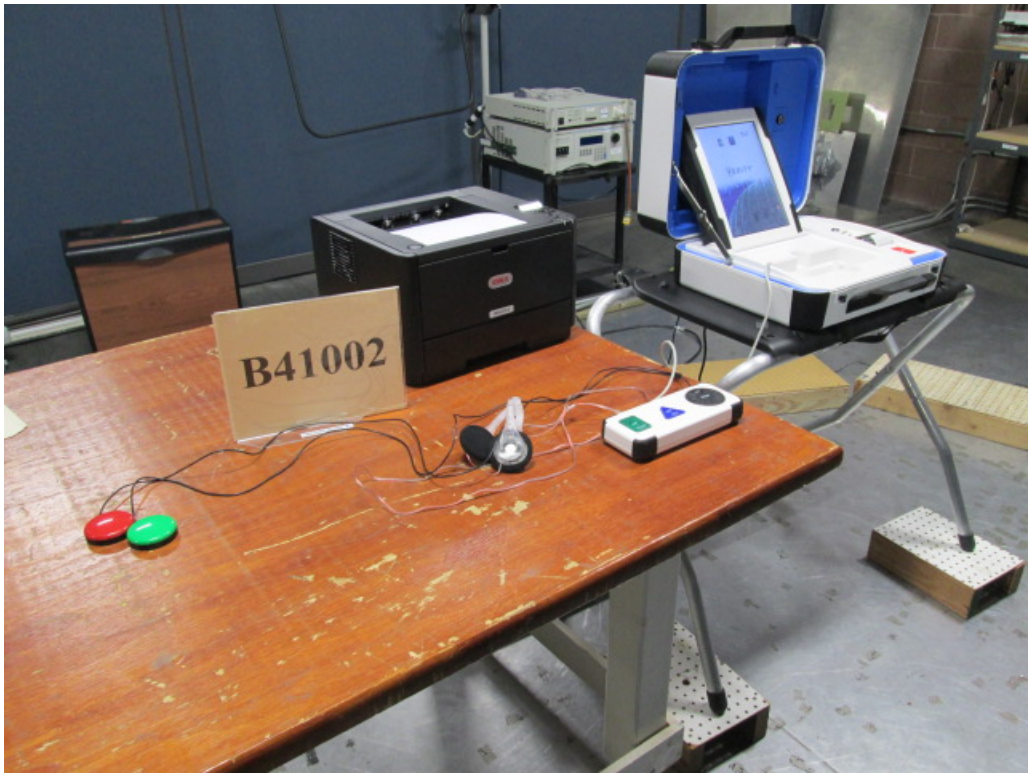

Figure C1. Electrical Fast Transient Test Setup – AC Mains.

Electrical Fast Transient/Burst per IEC / EN 61000-4-4

Manufacturer:	SLI Global Solutions	Project Number:	B41002
Customer Representative:	Darrick Forester	Test Area:	GP1
Model:	2005352 (Touch Writer) Rev. B	S/N:	W1400007609
Standard Referenced:	IEC 61000-4-4	Date:	October 23, 2014

B41002-4-4.doc FR0100

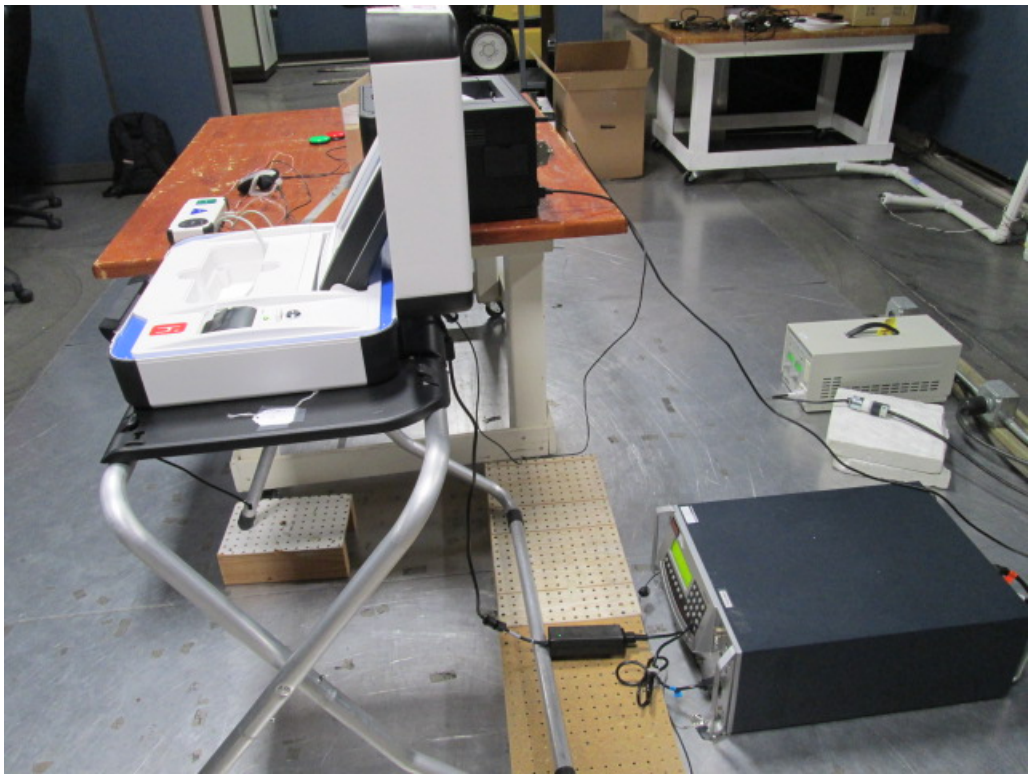

Figure C2. Electrical Fast Transient Test Setup – AC Mains.

emc integrity incorporated

Electrical Fast Transient/Burst per IEC / EN 61000-4-4

Manufacturer:	SLI Global Solutions	Project Number:	B41002
Customer Representative:	Darrick Forester	Test Area:	GP1
Model:	2005352 (Touch Writer) Rev. B	S/N:	W1400007609
Standard Referenced:	IEC 61000-4-4	Date:	October 23, 2014

B41002-4-4.doc FR0100

Test Equipment List

ID Number	Manufacturer	Model #	Serial #	Description	Cal Date	Cal Due
1184	KeyTek	CEWare32	NA	KeyTek EMCPro Control Software for EFT, Surge, H-F	NA	NA
1284	ThermoFischer Scientific	EMC Pro Plus - USA	0705276	EFT, Surge, H-field & PQF Immunity Test Generator	05/22/2014	05/22/2015
1372	Tektronix	TDS2002B	C103489	Oscilloscope, 60 MHz, 2-channel	01/05/2014	01/05/2015
1549	California Instruments/A metek	1251P	1423A05348	AC power supply	NA	NA
1552	EXTECH Instruments	445715		Hygro-Thermometer	09/29/2014	09/29/2015

APPENDIX D

Surge Immunity Test Data

emc integrity incorporated

Surge Immunity per IEC / EN 61000-4-5

Manufacturer:	SLI Global Solutions	Project Number:	B41002
Customer Representative:	Darrick Forester	Test Area:	GP1
Model:	2005352 (Touch Writer) Rev. B	S/N:	W1400007609
Standard Referenced:	IEC 61000-4-5	Date:	October 23, 2014
Temperature:	21.2˚C Humidity: 38%	Pressure:	840 mb
Input Voltage:	120Vac/60Hz		
Configuration of Unit:	Writing to V Drive, Play Audio, Printing to thermal Printer and OKI B431d Printer		
Test Engineer:	Mark Novak		

B41002-4-5.doc FR0100

Voltage (kV)	Polarity +	Polarity -	L 1	L 2	L 3	N	PE	Phase (deg)	Number of Pulses	Delay (sec)	Comments	Criteria Met	Pass / Fail
0.5	x		x			x		0	5	30	Differential Mode	A	Pass
0.5		x	x			x		0	5	30		A	Pass
0.5	x		x			x		90	5	30		A	Pass
0.5		x	x			x		90	5	30		A	Pass
0.5	x		x			x		180	5	30		A	Pass
0.5		x	x			x		180	5	30		A	Pass
0.5	x		x			x		270	5	30		A	Pass
0.5		x	x			x		270	5	30		A	Pass
0.5	x		x				x	0	5	30	Common Mode Line	A	Pass
0.5		x	x				x	0	5	30		A	Pass
0.5	x		x				x	90	5	30		A	Pass
0.5		x	x				x	90	5	30		A	Pass
0.5	x		x				x	180	5	30		A	Pass
0.5		x	x				x	180	5	30		A	Pass
0.5	x		x				x	270	5	30		A	Pass
0.5		x	x				x	270	5	30		A	Pass
0.5	x					x	x	0	5	30	Common Mode Neutral	A	Pass
0.5		x				x	x	0	5	30		A	Pass
0.5	x					x	x	90	5	30		A	Pass
0.5		x				x	x	90	5	30		A	Pass
0.5	x					x	x	180	5	30		A	Pass
0.5		x				x	x	180	5	30		A	Pass
0.5	x					x	x	270	5	30		A	Pass
0.5		x				x	x	270	5	30		A	Pass
1.0	x		x			x		0	5	60	Differential Mode	A	Pass
1.0		x	x			x		0	5	60		A	Pass
1.0	x		x			x		90	5	60		A	Pass
1.0		x	x			x		90	5	60		A	Pass
1.0	x		x			x		180	5	60		A	Pass
1.0		x	x			x		180	5	60		A	Pass
1.0	x		x			x		270	5	60		A	Pass
1.0		x	x			x		270	5	60		A	Pass
1.0	x		x				x	0	5	45	Common Mode Line	A	Pass
1.0		x	x				x	0	5	45		A	Pass

emc integrity incorporated

Surge Immunity per IEC / EN 61000-4-5

Manufacturer:	SLI Global Solutions	Project Number:	B41002
Customer Representative:	Darrick Forester	Test Area:	GP1
Model:	2005352 (Touch Writer) Rev. B	S/N:	W1400007609
Standard Referenced:	IEC 61000-4-5	Date:	October 23, 2014
Temperature:	21.2˚C Humidity: 38%	Pressure:	840 mb
Input Voltage:	120Vac/60Hz		
Configuration of Unit:	Writing to V Drive, Play Audio, Printing to thermal Printer and OKI B431d Printer		
Test Engineer:	Mark Novak		

B41002-4-5.doc FR0100

Voltage (kV)	Polarity +	Polarity -	L 1	L 2	L 3	N	PE	Phase (deg)	Number of Pulses	Delay (sec)	Comments	Criteria Met	Pass / Fail
1.0	x		x				x	90	5	45		A	Pass
1.0		x	x				x	90	5	45		A	Pass
1.0	x		x				x	180	5	45		A	Pass
1.0		x	x				x	180	5	45		A	Pass
1.0	x		x				x	270	5	45		A	Pass
1.0		x	x				x	270	5	45		A	Pass
1.0	x					x	x	0	5	45	Common Mode Neutral	A	Pass
1.0		x				x	x	0	5	45		A	Pass
1.0	x					x	x	90	5	45		A	Pass
1.0		x				x	x	90	5	45		A	Pass
1.0	x					x	x	180	5	45		A	Pass
1.0		x				x	x	180	5	45		A	Pass
1.0	x					x	x	270	5	45		A	Pass
1.0		x				x	x	270	5	45		A	Pass
2.0	x		x				x	0	5	60	Common Mode Line	A	Pass
2.0		x	x				x	0	5	60		A	Pass
2.0	x		x				x	90	5	60		A	Pass
2.0		x	x				x	90	5	60		A	Pass
2.0	x		x				x	180	5	60		A	Pass
2.0		x	x				x	180	5	60		A	Pass
2.0	x		x				x	270	5	60		A	Pass
2.0		x	x				x	270	5	60		A	Pass
2.0	x					x	x	0	5	60	Common Mode Neutral	A	Pass
2.0		x				x	x	0	5	60		A	Pass
2.0	x					x	x	90	5	60		A	Pass
2.0		x				x	x	90	5	60		A	Pass
2.0	x					x	x	180	5	60		A	Pass
2.0		x				x	x	180	5	60		A	Pass
2.0	x					x	x	270	5	60		A	Pass
2.0		x				x	x	270	5	60		A	Pass
2.0	x		x			x		0	5	60	Differential Mode	A	Pass
2.0		x	x			x		0	5	60		A	Pass
2.0	x		x			x		90	5	60		A	Pass
2.0		x	x			x		90	5	60		A	Pass
2.0	x		x			x		180	5	60		A	Pass
2.0		x	x			x		180	5	60		A	Pass

emc integrity incorporated

Surge Immunity per IEC / EN 61000-4-5

Manufacturer:	SLI Global Solutions	Project Number:	B41002
Customer Representative:	Darrick Forester	Test Area:	GP1
Model:	2005352 (Touch Writer) Rev. B	S/N:	W1400007609
Standard Referenced:	IEC 61000-4-5	Date:	October 23, 2014
Temperature:	21.2˚C Humidity: 38%	Pressure:	840 mb
Input Voltage:	120Vac/60Hz		
Configuration of Unit:	Writing to V Drive, Play Audio, Printing to thermal Printer and OKI B431d Printer		
Test Engineer:	Mark Novak		

B41002-4-5.doc FR0100

Voltage (kV)	Polarity +	Polarity -	L 1	L 2	L 3	N	P E	Phase (deg)	Number of Pulses	Delay (sec)	Comments	Criteria Met	Pass / Fail
2.0	x		x			x		270	5	60		A	Pass
2.0		x	x			x		270	5	60		A	Pass

emc integrity incorporated

Surge Immunity per IEC / EN 61000-4-5

Manufacturer:	SLI Global Solutions	Project Number:	B41002
Customer Representative:	Darrick Forester	Test Area:	GP1
Model:	2005352 (Touch Writer) Rev. B	S/N:	W1400007609
Standard Referenced:	IEC 61000-4-5	Date:	October 23, 2014

B41002-4-5.doc FR0100

Figure D1. Surge Immunity Test Setup

emc integrity incorporated

Surge Immunity per IEC / EN 61000-4-5

Manufacturer:	SLI Global Solutions	Project Number:	B41002
Customer Representative:	Darrick Forester	Test Area:	GP1
Model:	2005352 (Touch Writer) Rev. B	S/N:	W1400007609
Standard Referenced:	IEC 61000-4-5	Date:	October 23, 2014

B41002-4-5.doc FR0100

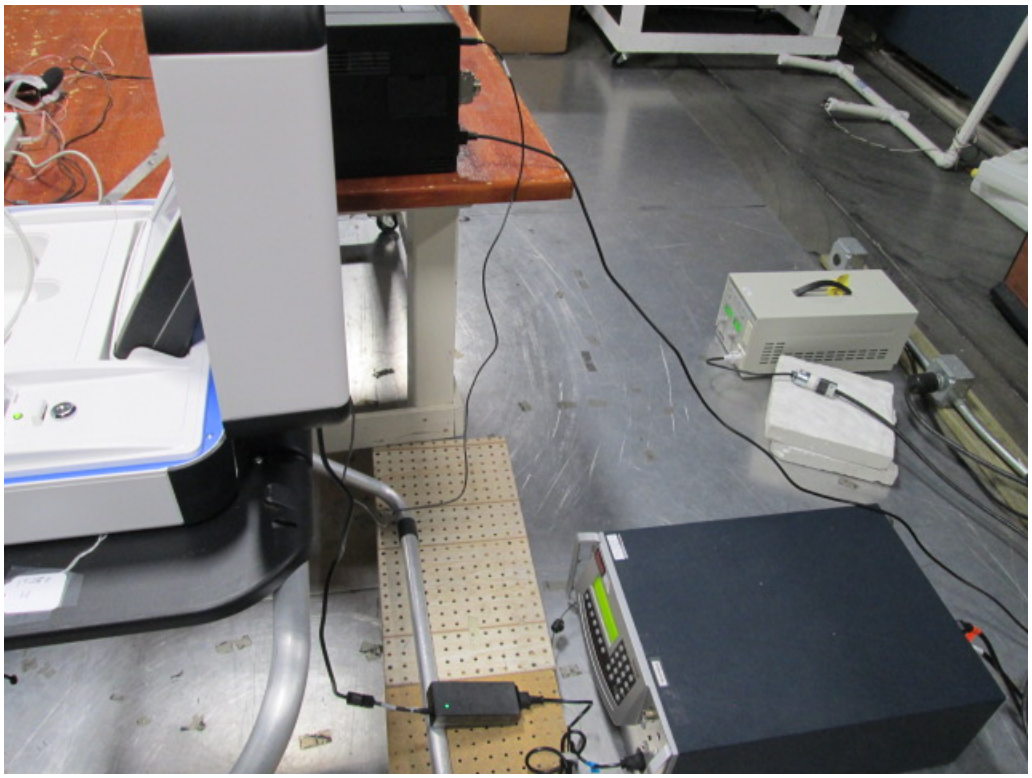

Figure D2. Surge Immunity Test Setup – AC Mains

Surge Immunity per IEC / EN 61000-4-5

Manufacturer:	SLI Global Solutions	Project Number:	B41002
Customer Representative:	Darrick Forester	Test Area:	GP1
Model:	2005352 (Touch Writer) Rev. B	S/N:	W1400007609
Standard Referenced:	IEC 61000-4-5	Date:	October 23, 2014

B41002-4-5.doc FR0100

Test Equipment List

ID Number	Manufacturer	Model #	Serial #	Description	Cal Date	Cal Due
1184	KeyTek	CEWare32	NA	KeyTek EMCPro Control Software for EFT, Surge, H-F	NA	NA
1284	ThermoFischer Scientific	EMC Pro Plus - USA	0705276	EFT, Surge, H-field & PQF Immunity Test Generator	05/22/2014	05/22/2015
1372	Tektronix	TDS2002B	C103489	Oscilloscope, 60 MHz, 2-channel	01/05/2014	01/05/2015
1549	California Instruments/A metek	1251P	1423A05348	AC power supply	NA	NA
1552	EXTECH Instruments	445715		Hygro-Thermometer	09/29/2014	09/29/2015

APPENDIX E

Conducted RF Immunity Test Data

emc integrity incorporated

Conducted RF Immunity per IEC / EN 61000-4-6

Manufacturer:	SLI Global Solutions	Project Number:	B41002
Customer Representative:	Darrick Forester	Test Area:	GP2
Model:	2005352 (Touch Writer) Rev. B	S/N:	W1400006609 UUT AK46022066A0 Printer
Standard Referenced:	IEC 61000-4-6	Date:	October 2, 2014
Temperature:	21.5˚C Humidity: 32%	Pressure:	839 mb
Input Voltage:	120Vac/60Hz		
Configuration of Unit:	Writing to V Drive, Play Audio, Printing to thermal Printer and OKI B431d Printer		
Test Engineer:	Casey Lockhart/Tom Wittig		

B41002-4-6.doc FR0100

Frequency (MHz)	Modulation			Level (Vrms)	Dwell (sec)	Comments	Criteria Met	Pass / Fail
	Type	%	Freq					
0.150 – 80.0	AM	80	1 kHz	10	3	AC using M3 CDN	A	Pass

emc integrity incorporated

Conducted RF Immunity per IEC / EN 61000-4-6

Manufacturer:	SLI Global Solutions	Project Number:	B41002
Customer Representative:	Darrick Forester	Test Area:	GP2
Model:	2005352 (Touch Writer) Rev. B	S/N:	W1400006609
Standard Referenced:	IEC 61000-4-6	Date:	October 2, 2014

B41002-4-6.doc FR0100

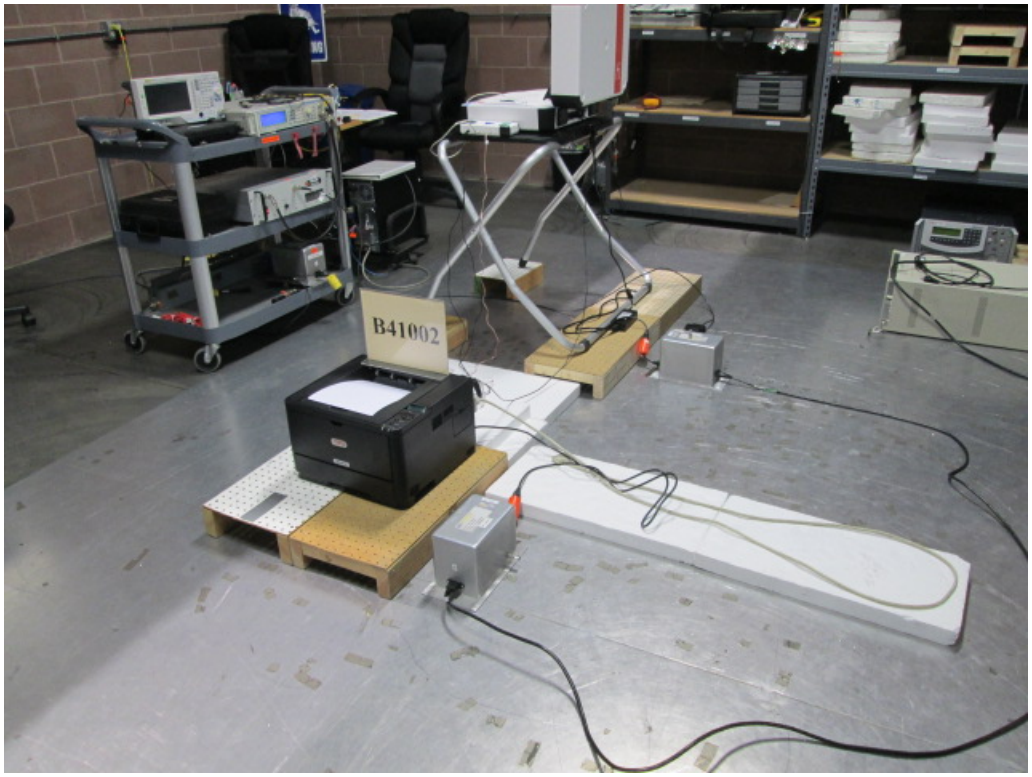

Figure E1. Conducted RF Immunity Test Setup.

emc integrity incorporated

Conducted RF Immunity per IEC / EN 61000-4-6

Manufacturer:	SLI Global Solutions	Project Number:	B41002
Customer Representative:	Darrick Forester	Test Area:	GP2
Model:	2005352 (Touch Writer) Rev. B	S/N:	W1400006609
Standard Referenced:	IEC 61000-4-6	Date:	October 2, 2014

B41002-4-6.doc FR0100

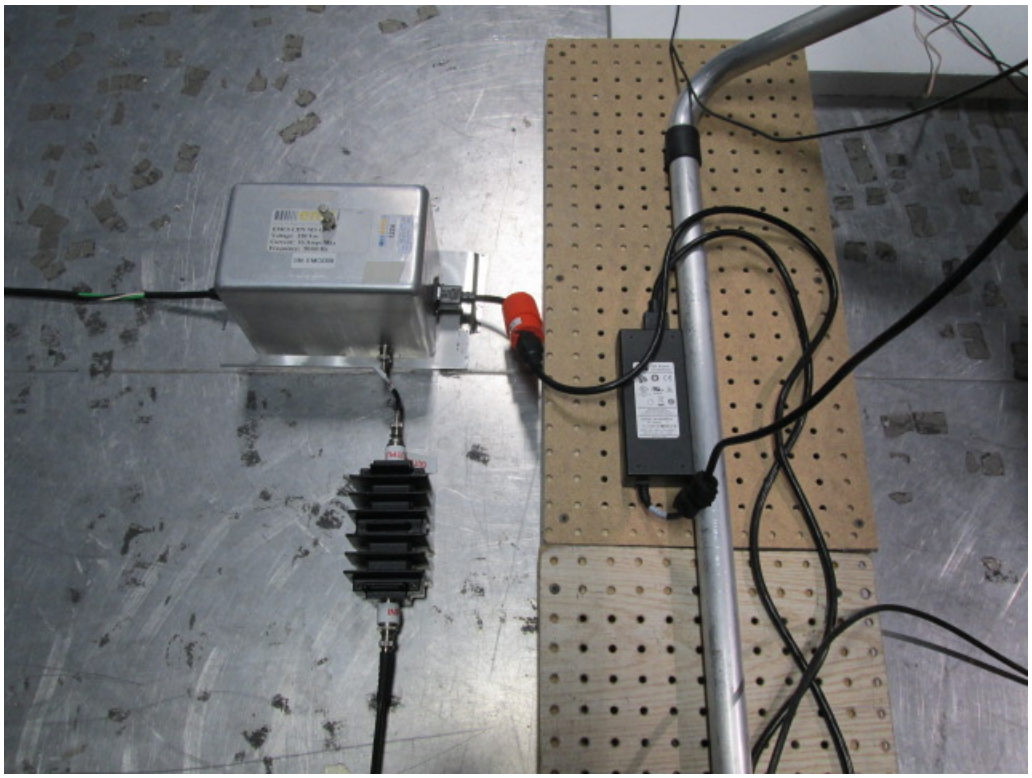

Figure E2. Conducted RF Immunity – AC Mains.

emc integrity incorporated

Conducted RF Immunity per IEC / EN 61000-4-6

Manufacturer:	SLI Global Solutions	Project Number:	B41002
Customer Representative:	Darrick Forester	Test Area:	GP2
Model:	2005352 (Touch Writer) Rev. B	S/N:	W1400006609
Standard Referenced:	IEC 61000-4-6	Date:	October 2, 2014

B41002-4-6.doc FR0100

Test Equipment List

ID Number	Manufacturer	Model #	Serial #	Description	Cal Date	Cal Due
1224	EMCI	EMCI-CDN-M3-16	EMCI009	M3 CDN, 16A, 250 VAC	03/13/2014	03/13/2015
1226	EMCI	EMCI-CDN-M3-16	EMCI011	M3 CDN, 16A, 250 VAC	03/05/2014	03/05/2015
1274	IFI	M100	L594-0108	100W Power Amplifier, 0.01 MHz to 220 MHz	NA	NA
1496	Rigol Technologies, Inc.	DSA815	DSA8B150500096	9 kHz to 1.5 GHz Spectrum Analyzer	02/25/2014	02/25/2015
1521	IFR	2023B	202301/889	Signal Generator (9 kHz - 2.05 GHz)	12/06/2013	12/06/2014
1536	Extech Instruments	445715	Z315811	Hygro-Thermometer	03/21/2014	03/21/2015

APPENDIX F

Power Frequency H-field Test Data

emc integrity incorporated

Power Frequency H-field Immunity per IEC / EN 61000-4-8

Manufacturer:	SLI Global Solutions	Project Number:	B41002
Customer Representative:	Darrick Forester	Test Area:	GP2
Model:	2005352 (Touch Writer) Rev. B	S/N:	W1400006609
Standard Referenced:	IEC 61000-4-8	Date:	October 6, 2014
Temperature:	23.4˚C Humidity: 34%	Pressure:	839 mb
Input Voltage:	120Vac/60Hz		
Configuration of Unit:	Writing to V Drive, Play Audio, Printing to thermal Printer and OKI B431d Printer		
Test Engineer:	Dean Wyant		

B41002-4-8.doc FR0100

Frequency (Hz) 50	Frequency (Hz) 60	Field Strength (A/m)	EUT Axis Location	Dwell Time (sec)	Comments	Criteria Met	Pass / Fail
x		30	Front	60		A	Pass
	x	30		60		A	Pass
x		30	Right	60		A	Pass
	x	30		60		A	Pass
x		30	Back	60		A	Pass
	x	30		60		A	Pass
x		30	Left	60		A	Pass
	x	30		60		A	Pass

emc integrity incorporated

Power Frequency H-field Immunity per IEC / EN 61000-4-8

Manufacturer:	SLI Global Solutions	Project Number:	B41002
Customer Representative:	Darrick Forester	Test Area:	GP2
Model:	2005352 (Touch Writer) Rev. B	S/N:	W1400006609
Standard Referenced:	IEC 61000-4-8	Date:	October 6, 2014

B41002-4-8.doc FR0100

Figure F1. Power Frequency H-field Immunity Test Setup.

emc integrity incorporated

Power Frequency H-field Immunity per IEC / EN 61000-4-8

Manufacturer:	SLI Global Solutions	Project Number:	B41002
Customer Representative:	Darrick Forester	Test Area:	GP2
Model:	2005352 (Touch Writer) Rev. B	S/N:	W1400006609
Standard Referenced:	IEC 61000-4-8	Date:	October 6, 2014

B41002-4-8.doc FR0100

Test Equipment List

ID Number	Manufacturer	Model #	Serial #	Description	Cal Date	Cal Due
1296	California Instruments Corporation	5001IX208-150/300	S59159	5k VA AC Power Source	01/13/2013	01/13/2015
1506	EMCI	EMCI-4-8-2m-1.5m	0003	HField Loop, 2m x 1.5m	08/14/2014	08/14/2015
1536	Extech Instruments	445715	Z315811	Hygro-Thermometer	03/21/2014	03/21/2015
1549	California Instruments/Ametek	1251P	1423A05348	AC power supply	NA	NA
1550	California Instruments/Ametek	1251P	1423A05346	AC Power Supply	NA	NA

APPENDIX G

Voltage Dip and Interrupts Test Data

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Voltage Dips and Interrupts per IEC / EN 61000-4-11

Manufacturer:	SLI Global Solutions	Project Number:	B41002
Customer Representative:	Darrick Forester	Test Area:	GP2
Model:	2005352 (Touch Writer) Rev. B	S/N:	W1400006609
Standard Referenced:	IEC 61000-4-11	Date:	October 3, 2014
Temperature:	21.8˚C Humidity: 32%	Pressure:	839mb
Input Voltage:	120Vac/60Hz		
Configuration of Unit:	Writing to V Drive, Play Audio, Printing to thermal Printer and OKI B431d Printer		
Test Engineer:	Mark Novak/Dean Wyant		

B41002-4-11.doc FR0100

% Nominal	No. of Cycles	Phase Angle (deg) 0	90	180	270	Time between dropouts (sec)	Number of tests	Comments	Criteria Met	Pass / Fail
60Hz Tests										
40%	6	x				10	3		A	Pass
40%	6		x			10	3		A	Pass
40%	6			x		10	3		A	Pass
40%	6				x	10	3		A	Pass
70%	0.5	x				10	3		A	Pass
70%	0.5		x			10	3		A	Pass
70%	0.5			x		10	3		A	Pass
70%	0.5				x	10	3		A	Pass
0%	300	x				10	3		A	Pass
0%	300			x		10	3		A	Pass
40%	60	x				10	3		A	Pass
40%	60		x			10	3		A	Pass
40%	60			x		10	3		A	Pass
40%	60				x	10	3		A	Pass
50Hz Tests										
40%	50	x				10	3		A	Pass
40%	50		x			10	3		A	Pass
40%	50			x		10	3		A	Pass
40%	50				x	10	3		A	Pass
70%	50	x				10	3		A	Pass
70%	50		x			10	3		A	Pass
70%	50			x		10	3		A	Pass
70%	50				x	10	3		A	Pass
0%	250	x				10	3		A	Pass
0%	250			x		10	3		A	Pass
Line Voltage Variations										
128Vac Line Voltage Variations (+7.5% of nominal 120V)									A	Pass
105Vac Line Voltage Variations (-7.5% of nominal 120V)									A	Pass

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Voltage Dips and Interrupts per IEC / EN 61000-4-11

Manufacturer:	SLI Global Solutions	Project Number:	B41002
Customer Representative:	Darrick Forester	Test Area:	GP2
Model:	2005352 (Touch Writer) Rev. B	S/N:	W1400006609
Standard Referenced:	IEC 61000-4-11	Date:	October 3, 2014

B41002-4-11.doc FR0100

Figure G1. Voltage Dips and Interruptions Test Setup.

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Voltage Dips and Interrupts per IEC / EN 61000-4-11

Manufacturer:	SLI Global Solutions	Project Number:	B41002
Customer Representative:	Darrick Forester	Test Area:	GP2
Model:	2005352 (Touch Writer) Rev. B	S/N:	W1400006609
Standard Referenced:	IEC 61000-4-11	Date:	October 3, 2014

B41002-4-11.doc FR0100

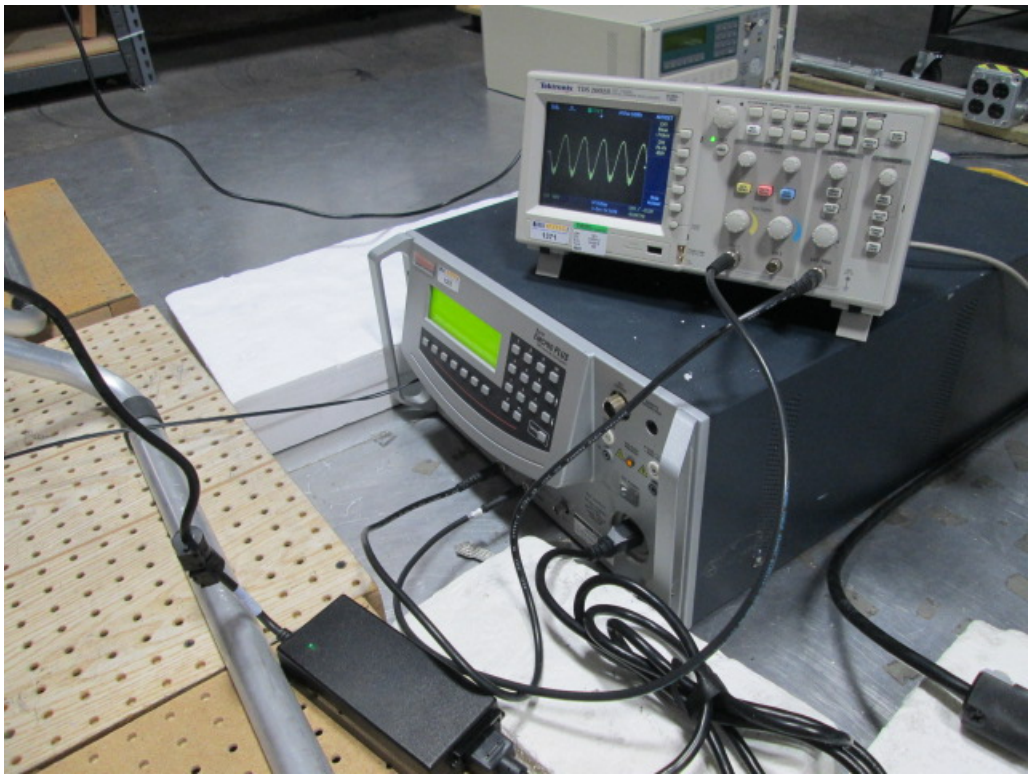

Figure G2. Voltage Dips and Interruptions Test Setup.

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Voltage Dips and Interrupts per IEC / EN 61000-4-11

Manufacturer:	SLI Global Solutions	Project Number:	B41002
Customer Representative:	Darrick Forester	Test Area:	GP2
Model:	2005352 (Touch Writer) Rev. B	S/N:	W1400006609
Standard Referenced:	IEC 61000-4-11	Date:	October 3, 2014

B41002-4-11.doc FR0100

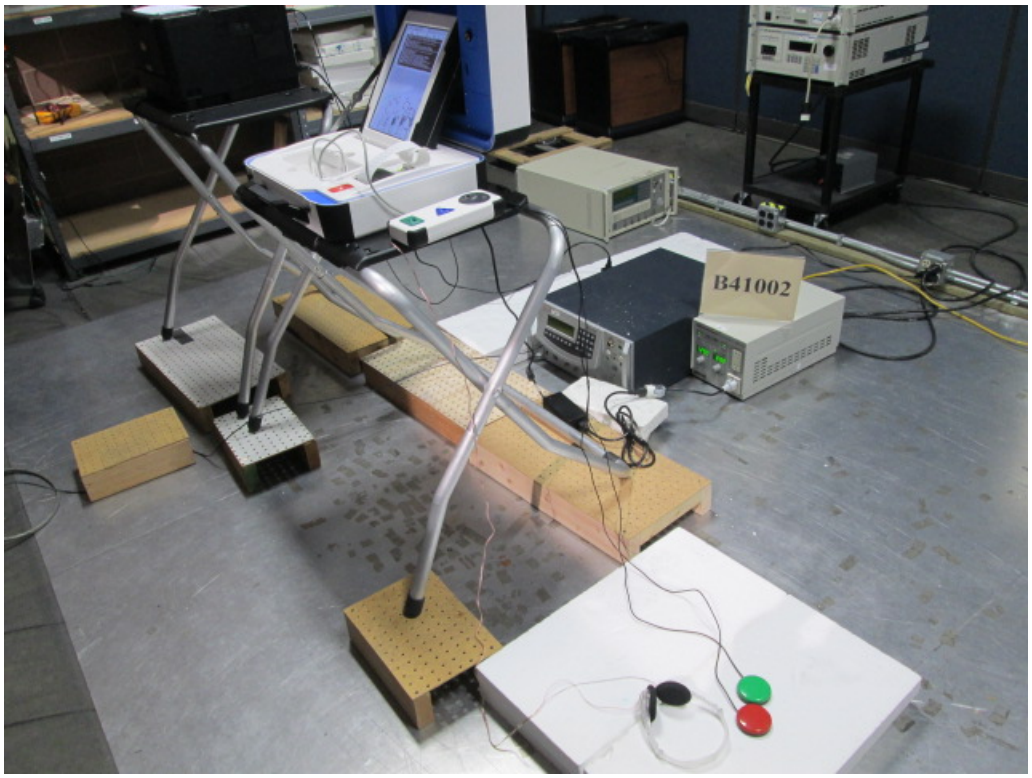

Figure G3. Voltage Dips and Interruptions Test Setup. Line Voltage Variations

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Voltage Dips and Interrupts per IEC / EN 61000-4-11

Manufacturer:	SLI Global Solutions	Project Number:	B41002
Customer Representative:	Darrick Forester	Test Area:	GP2
Model:	2005352 (Touch Writer) Rev. B	S/N:	W1400006609
Standard Referenced:	IEC 61000-4-11	Date:	October 3, 2014

B41002-4-11.doc FR0100

Test Equipment List

ID Number	Manufacturer	Model #	Serial #	Description	Cal Date	Cal Due
1184	KeyTek	CEWare32	NA	KeyTek EMCPro Control Software for EFT, Surge, H-F	NA	NA
1283	KeyTek	EMCPro Plus	0601237	Advanced EMC Immunity Tester	05/21/2014	05/21/2015
1372	Tektronix	TDS2002B	C103489	Oscilloscope, 60 MHz, 2-channel	01/05/2014	01/05/2015
1536	Extech Instruments	445715	Z315811	Hygro-Thermometer	03/21/2014	03/21/2015
1550	California Instruments/Ametek	1251P	1423A05346	AC Power Supply	NA	NA

APPENDIX H

EMI/EMC Test Plan

Hart InterCivic
Verity Scan, Verity Touch Writer, Ballot Box, Standard and Accessible Booths
EMC / EMI Test Plan for compliance with the 2005 Voluntary Voting System Guidelines (VVSG)

By

216 16th St, Suite 700
Denver, CO 80202
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Revision History:

Version	Date	Comments	Contributors
0.9	1/29/14	Initial Release	D. Forester
1.0	3/7/14	Updates based on review	D. Forester
2.0	3/20/14	Update serial numbers and Table 1. Added RFI 2007-05 (COTS)	D. Forester
3.0	4/3/14	Added RFI 2008-10 (EFT)	D. Forester
4.0	10/23/14	Update FCC Class B 10m spec. provide maximum flexibility in testing ,updated exit criteria and added section 4.1	D. Forester
5.0	11/3/14	Add ESD Limit Statement	D. Forester

Table of Contents

List of Tables

List of Figures

1.0 Introduction

1.1 Overview

This test plan covers the EMC (Electromagnetic Compatibility) and EMI (Electromagnetic Interference) test requirements and methods for the Hart InterCivic Verity 1.0 Scan and Touch Writer, Ballot Box, and Standard / Accessible Booths hereafter known as the Unit Under Test (UUT), to the requirements as stated in Election Assistance Commission 2005 Voluntary Voting System Guidelines (VVSG).

1.2 Qualifications

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

1.3 Client

Hart InterCivic
15500 Wells Port Drive
Austin, TX 78728

1.4 Company Restricted Information

This document contains confidential and restricted information and shall not be reproduced outside of SLI Global Solutions without written consent.

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1.5 Reference Documents

- Election Assistance Commission 2005 Voluntary Voting System Guidelines Vol I Version 1.0
- Election Assistance Commission 2005 Voluntary Voting System Guidelines Vol II Version 1.0
- NIST Handbook 150-22, 2008 Edition: National Voluntary Laboratory Accreditation Program – Voting System Testing. May 2008
- 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
- EAC: NOC 07-05: Voting System Test Laboratory (VSTL) responsibilities in the management and oversight of third party testing.
- EAC: NOC 08-001: Validity of Prior Non-Core Hardware Environmental and EMC Testing.
- SLI Standard Lab Procedure SLP-VC-23: Hardware Test Management
- SLI Standard Lab Procedure SLP-VC-24: Subcontractor Laboratory Management
- Hart InterCivic Verity: EMC/EMI, Environmental, Safety Test Plan, Document Number: 4005516, Rev. A.03

2.0 EMC / EMI Test Summary

Table 1: EMC / EMI Test Requirements Summary for Hart InterCivic Verity Scan and Verity Touch Writer

Required	Test	Test Spec.	VVSG Reference	Requirement	Comments
Electromagnetic Emissions Tests					
X	Radiated Electromagnetic Emissions	FCC, Part 15 ANSI C63.4	V1, 4.1.2.9 V1, 4.1.7.1 V1, 2.1.4 (b) V2, 4.8	Class B	Internal Battery Not Connected
X	Conducted Electromagnetic Emissions	FCC, Part 15 ANSI C63.4	V1, 4.1.2.9 V1, 4.1.7.1 V1, 2.1.4 (b) V2, 4.8	Class B	Internal Battery Not Connected
Electromagnetic Immunity Tests					
X	Electrostatic Disruption	IEC 61000-4-2 (2008) Ed.2.0	V1, 4.1.2.8 V1, 4.1.7.1 V1, 2.1.4 (b) V2, 4.8	Vote scanning and counting equipment for paper-based systems, and all DRE equipment, shall be able to withstand ±15 kV air discharge and ±8 kV contact discharge 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 means votes that have been completed and confirmed to the voter.	Voting systems are required to be immune to ESD up to the limits of 8 KV, contact discharge, and 15 KV, air discharge. 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. (RFI 2010-01) The test levels stated in IEC 61000-4-2, Edition 2.0, contact discharge, are the test method and shall be applied at the specified test level only, 8 kV. Air discharge shall be used where contact discharge cannot be applied and all test levels shall be used (2, 4, 8, 15 kV). (RFI 2010-01)
X	Electromagnetic Susceptibility	IEC 61000-4-3 (1996)	V14.1.2.10 V1, 4.1.7.1 V1, 2.1.4 (b) V2, 4.8	A field of 10 V/m modulated by a 1 kHz 80% AM modulation over the frequency range of 80 MHz to 1000 MHz	1 GHz
X	Electrical Fast Transient	IEC 61000-4-4 (2004-07) Ed. 2.0	V1, 4.1.2.6 V1, 4.1.7.1 V1, 2.1.4 (b) V2, 4.8	±2kV AC & DC external power lines ±1kV on Input / Output lines (signal, data, control lines) longer than 3 meters(signal, data, control lines) longer than 3 meters Repetition Rate for all transient pulses will be 100 kHz	Internal Battery Connected The Standard specified in Volume II Section 4.8 is mistakenly cited as IEC 61000-4-4 (1995-01), and should instead properly be cited as IEC 61000-4-4 (2004-07) Ed. 2.0 which supports the 100 kHz repetition rate for all transient pulses specified in Volume I, Section 4.1.2.6(c). (RFI 2008-10)
X	Lightning Surge	IEC 61000-4-5 (1995-02)	V1, 4.1.2.7 V1, 4.1.7.1 V1, 2.1.4 (b) V2, 4.8	±2 kV AC line to line; ±2 kV AC line to earth; ±0.5 kV DC line to line >10m; ±0.5 kV DC line to earth >10m; and ±1 kV I/O sig/control >30m.	Internal Battery Connected
X	Conducted RF Immunity	IEC 61000-4-6 (1996-04)	V1, 4.1.2.11 V1, 4.1.7.1	10V rms,150 KHz to 80 MHz with an 80% AM with a 1 KHz sine wave AC & DC	Internal Battery Connected

3.0 Product Description

3.1 Intended Use

For the Verity 1.0 refer to EMC Integrity's detailed Product Data Sheets below starting with section 3.4 Product Information. The Product Data Sheets will be used by EMC Integrity's test technicians during testing and also in writing the test reports.

3.2 Unit Under Test – Verity Scan

Part No.	Serial No.	Description	Qty	Revision No.
2005350	S1400005009 S1400005809 S1400005909	Verity Scan - is Verity's polling place scanning solution for paper ballots. Scan is paired with a purpose-built ballot box to ensure accurate, secure, and private ballot scanning and vote casting for each voter.	3	B
2005357	X14000102	Ballot Box – Used with Verity Scan.	1	A

3.3 Unit Under Test – Verity Touch Writer

Part No.	Serial No.	Description	Qty	Revision No.
2005352	W1400006609 W1400007309 W1400007409 W1400007609	Verity Touch Writer - is a polling place ballot marking device solution for paper ballots. Touch Writer is paired with a commercial off the shelf printer to allow the voter to mark then print their vote selections. Using Touch Writer reviewing and acceptance in conjunction with Verity Scan provides the voter with a reviewable paper ballot that is accurately captured through scanning, for tabulation as a voter's cast vote record (CVR).	4	B
2005358	M14000102	Standard Booth - Used with Touch Writer	1	A
2005359	L14000102	Accessible Booth - Used with Touch Writer	1	A

3.4 Product Information – Verity Scan

Product Information General	
Product Name (**as it should appear on test report**)	Verity Scan
Model Number (of UUT to be tested)	2005350 (Scan), 2005357 (Ballot Box)
Functional description of product (what is it, what does it do, etc.)	Polling Place Scanning Device – scans paper ballots
List all modes of operation	Ballot Scanner
Can modes be operated simultaneously? If so, explain.	No
What mode(s) will be used for testing?	Ballot Scanning USB Stick Write Test Thermal Printer Test

Hart InterCivic
Verity EMC / EMI Test Plan

Product type (IT, Medical, Scientific, Industrial, etc.)	IT
Is the product an intentional radiator	No
Product Dimensions	Verity Scan Storage/Shipping Carton - 21½"Wx17½"Dx19 ¾"H Device Closed – 18.8"Wx17.39"Dx7.72"H Device Open – 18.8"Wx21.41"Dx20.86"H Ballot Box Collapsed for Storage - 26"Wx5.23"Dx28.25"H Deployed for Use – 26"Wx23.25"Dx28.25"H
Product Weight	Scan - 27lbs Ballot Box - 26.5lbs
Will fork lift be required	No
Applicable Standards, if known	VVSG 2005: FCC Part 15 Class B IEC 61000-4: -2, -3, -4, -5, -6, -8, -11
Describe all environment(s) where product will be used (residential, commercial, industrial, etc.)	Business Recommended Operating Environment Temperature: +50F to +95F Humidity: 10% to 90% Recommended Storage Environment Temperature: -4F to +140F Relative Humidity: <90%
Does product consist of multiple components? (If yes, please describe each system component)	Yes, scanner attaches to ballot box in normal use – it is expected to use this configuration for EMC/EMI testing of Verity Scan
Cycle time > 3 seconds? (If yes, how long?)	Yes for shoeshine testing - ~3 second cycle time Yes for normal usage - ~420 second cycle time
Highest internally generated frequency	Tablet CPU – 1.86GHz
Product Set-up Time	<15 minutes
Boot up time in the event of an unintentional power down	Booting into Windows takes ~60 seconds, we will use simulation tools to exercise the system during testing Booting into Verity Application with polls open takes ~300 seconds

Identify **ALL** I/O connections on the unit(s) under test, as well as **MAXIMUM** associated cable lengths below

Model No.	Description	I/O Type		Length (m)	Patient Connect? (See Note)	QTY
		UUT-UUT	UUT - SE			
Verity Scan	Polling place scanning device					1
Ballot Box	Ballot Box used with Verity Scan					1

Note: "Patient Connect" column applies only to medical devices.

3.4.1 Power

Power Requirements – Verity Scan	
Does/can product connect to AC mains? (If so, can the UUT function when connected to AC?)	Device is DC powered, there is a 85W AC/DC power supply (Yes)
Input Voltage Rating as it appears on unit, power supply, or power brick	24VDC, 2.4A
Input Current (specify @ 115 VAC/60 Hz)	XP Power AHM85PS24 - 85W, ~1.0A @ 100V – 0.4A @ 240V Power Brick Input ~1.0A
Single or Multi-Phase (If multi-phase, specify delta or wye)	Single
Is input power connector two-prong (Hot & Neutral) or 3-prong (H, N, Ground)	3-prong
Does UUT have more than 1 power cord? (If yes, explain.)	No

3.4.2 Services

Services Requested – Verity Scan		
Testing Required (Formal or Engineering)	Formal	
Special/specific test considerations (i.e. Engineering testing requested, extended range testing, etc.)		
Check all countries/economic areas in which product will be sold.	United States (FCC – emissions only)	X

	Canada (CSA – emissions only)	
	European Union (CE Mark)	
	Australia/New Zealand (C-tick)	
	Taiwan (BSMI)	
	Korea (KCC)	
	Japan (50 Hz)	
	Japan (60 Hz)	
	China (CCC)	
	Others (please specify)	
If this is for engineering, will a test report be required?	Yes	
Will you require a recommendation for product safety?	TBD	

3.5 Product Information - Verity Touch Writer

Product Information General	
Product Name (**as it should appear on test report**)	Verity Touch Writer
Model Number (of UUT to be tested)	2005352 (Touch Writer) 2005358 (Standard Booth) 2005359 (Accessible Booth)
Functional description of product (what is it, what does it do, etc.)	Polling Place Ballot Marking Device
List all modes of operation	Ballot Marking,
Can modes be operated simultaneously? If so, explain.	No
What mode(s) will be used for testing?	USB Stick Write Test Audio Playing Test USB Printer Test Thermal Printer Test Ballot Marking (Post-test)
Product type (IT, Medical, Scientific, Industrial, etc.)	IT
Is the product an intentional radiator	No
Product Dimensions	Touch Writer Storage/Shipping Carton - 21½"Wx17½"Dx19¾"H

	Device Closed – 18.8"Wx17.39"Dx7.72"H Device Open – 18.8"Wx21.41"Dx20.86"H Standard Booth Collapsed for Storage – 28.72"Wx5.57"Dx39.69"H Deployed for Use – 28.54"Wx23.17"Dx33.56"H Privacy Screen – adds 23.31" to Height Accessible Booth Collapsed for Storage 38.8"Wx5.83"Dx33"H Deployed for Use – 38.8"Wx25.45"Dx30.19"H Privacy Screen – adds 23.31" to Height
Product Weight	Touch Writer - 27lbs Standard Booth w/ storage bag - 13lbs Accessible Booth w/ storage bag - 14lbs
Will fork lift be required	No
Applicable Standards, if known	VVSG 2005: FCC Part 15 Class B IEC 61000-4: -2, -3, -4, -5, -6, -8, -11
Describe all environment(s) where product will be used (residential, commercial, industrial, etc.)	Business Recommended Operating Environment Temperature: +50F to +95F Humidity: 10% to 90% Recommended Storage Environment Temperature: -4F to +140F Relative Humidity: <90%
Does product consist of multiple components? (If yes, please describe each system component)	Yes – Touch Writer attaches to ballot booth in normal use – it is expected to use this configuration only for EMC/EMI testing of Verity Touch Writer OKI Data Printer – B431d
Cycle time > 3 seconds? (If yes, how long?)	Yes for normal usage - ~420 second cycle time
Highest internally generated frequency	Tablet CPU – 1.86GHz
Product Set-up Time	<15 minutes
Boot up time in the event of an unintentional power down	Booting into Windows takes ~60 seconds, testing with simulation applications takes ~60 seconds. Booting into Verity Application with polls open takes ~600 seconds

Identify **ALL** I/O connections on the unit(s) under test, as well as **MAXIMUM** associated cable lengths below

Model No.	Description	I/O Type		Length (m)	Patient Connect? (See Note)	QTY
		UUT-UUT	UUT - SE			
Verity Touch Writer	Polling place scanning device	USB	USB		n/a	1
Verity Access	Audio-Tactile Interface (ATI) module	USB		2m	n/a	1
OKI B431d	Printer		USB	2m	n/a	1
Standard Booth	Standard Booth used with Verity Touch Writer				n/a	1
Accessible Booth	Accessible Booth used with Verity Touch Writer				n/a	1

Note: "Patient Connect" column applies only to medical devices.

3.5.1 Power

Power Requirements Verity Touch Writer	
Does/can product connect to AC mains? (If so, can the UUT function when connected to AC?)	Yes (Yes)
Input Voltage Rating as it appears on unit, power supply, or power brick	24VDC, 2.4A
Input Current (specify @ 120 Vac/60 Hz)	XP Power AHM85PS24 - 85W, ~1.0A @ 100V – 0.4A @ 240V Power Brick Input ~1.0A
Single or Multi-Phase (If multi-phase, specify delta or wye)	Single
Is input power connector two-prong (Hot & Neutral) or 3-prong (H, N, Ground)	3-prong
Does UUT have more than 1 power cord? (If yes, explain.)	No

3.5.2 Services

Services Requested Verity Touch Writer		
Testing Required (Formal or Engineering)	Formal	
Special/specific test considerations (i.e. Engineering testing requested, extended range testing, etc.)		
Check all countries/economic areas in which	United States (FCC – emissions	X

product will be sold.	only)	
	Canada (CSA – emissions only)	
	European Union (CE Mark)	
	Australia/New Zealand (C-tick)	
	Taiwan (BSMI)	
	Korea (KCC)	
	Japan (50 Hz)	
	Japan (60 Hz)	
	China (CCC)	
	Others (please specify)	
If this is for engineering, will a test report be required?		
Will you require a recommendation for product safety?		

3.5.3 Support Equipment (SE) – Detailed Information

Support Equipment (SE)			
Name	**Model No.**	**Serial No.**	**Description**
OKIDATA	B431d	AK43004558A0 AK46022060A0 AK46022066A0 AK47007784A0 AK47007789A0	Ballot Printer

SE I/O Cabling				
Model No.	**Description**	**Shielded?**	**Length**	**Quantity**
N/A				

SE Software/Firmware		
Name	**Version/Revision**	**Functionality**

3.6 Engineering Changes

Engineering Change (EC)#	**Description**
N/A	

3.7 Power Supplies

Manufacturer	Model	Serial No.	Input	Output and Type
XP Power	AHM85PS24 – 85W	K12460073 / 2005415	~1.0A	@ 100V – 0.4A @ 240V

3.8 Accessories

Type	Model	Function
Verity Test Ballots		
Verity Keys		Load Election
Verity vDrives (Apacer / AMP)		Write Data to vDrive
USB Drives (2 per device)		
Thermal paper (1 extra per device		
Scanner cleaning kit		

3.9 Oscillator Frequencies

Frequency	Description of Use
0.307Mhz	
12Mhz	
240Mhz	
12Mhz	ATI, Base Board
24Mhz	ATI, PDI Scanner
1.86GHz	CPU

3.10 Interconnecting Cables

Type	Description	Shielded?	Length	Quantity

3.11 Software

Type	Version	Description
Verity Scan	0.17.11.16874	For Verity Scan
Verity Touch Writer	0.17.11.16874	For Verity Touch Writer

4.0 Test Plan

4.1 Units Under Test

Multiple Units Under Test of the same model with unique serial numbers may be used throughout EMC/EMI testing meeting the following criteria:

- To maximum scheduling flexibility
- UUT are identical models
- All hardware components are list in Vendor's bill of materials

List of Units Under Test can be found in section 3.2 and 3.3 of this document.

4.2 Operating Modes and Configurations for EMC Testing

4.2.1 *Operating Mode*

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

Verity Scan and Very Touch Writer will be in a test election mode and the following Verity applications will be executed:

- Shoe Shine test application – provides a method of exercising the integrated scanner in Verity Scan. When application runs a sheet of paper is inserted into the scanner and the scanner will continuously scan the inserted paper through its paper feeder, the scanned images are not saved. To stop the scanning process the paper must be grabbed and pulled out of the scanner. The scan rate is approximately once every 15 seconds
- Audio Test application – is used to test the Audio playback in Verity Touch Writer. This requires the Verity Access audio-tactile interface device be plugged into the Access port on the Verity Touch Writer and headsets or speakers be plugged in to the audio out port on the Access device. The audio played is a file that is specified in the applications folder. The audio track should be short, less than 5 seconds long; the audio application will play the MP4 audio file every 23 seconds with 17 second delay until the application is closed.
- USB Stick Test – is an application to write data to either of the USB ports that are inside Verity Scan and Touch Writers secure device compartment. This application uses a command line to specified location of the file to write and how often to write, the data written is Date-Time; by default the Date-Time is written at an approximate once an minute rate.
- Printer Test - is an application to print to the thermal printer integrated into Verity Scan and Touch Writers, in addition it can be configured, thru a configuration file, to print data to a USB printer connected to the Touch Writers printer port. The data printed is Date-Time; by default the Date-Time is printed at an approximate once a minute rate and once a five minute rate.

4.2.2 *Device Setup*

- Touch Writer will include OKI B431d COTS printer
- Prior to each test Scan will have scanner cleaned prior to running Verity Scan application
- Run Verity Scan application:

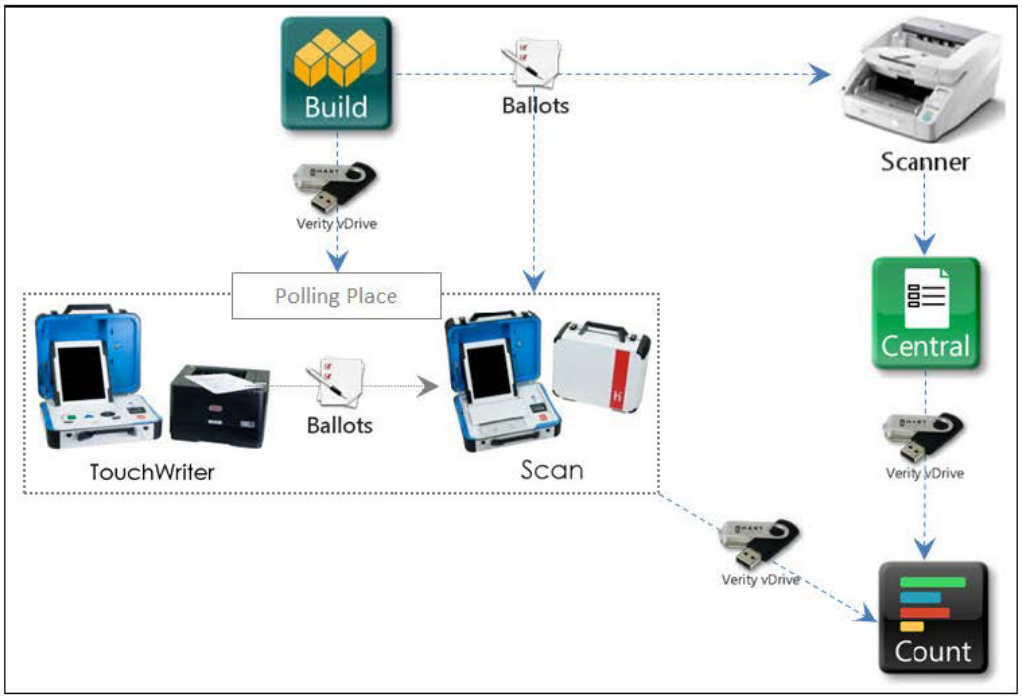
- Configure C:\Verity directory with proper database
- Load election
- Scan ballots (5 each)
- Suspend or Close election

- Run Verity Touch Writer application:
  - Load election
  - Print 1 ballot
- Run test applications:
  - Verity Scan:
    - Shoeshine (configure C:\Verity directory with proper database), USB Stick Test, Printer Test
  - Verity Touch Writer:
    - USB Stick Test, Audio Test, Printer Test, Mark / Print Ballot

4.2.3 Configurations

The following image is a general workflow of all Verity Voting system components working together.

Figure 1: Verity Voting Configuration



4.3 Treatment of Test Failures

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

4.4 Test Documentation

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

4.5 Test Facility Location

EMC Integrity, 1736 Vista View Drive, Longmont CO 80504

5.0 EMC / EMI Tests

5.1 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 VVSG.

5.1.1 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
(GHz) 1000-5000	43.5

5.1.2 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

5.2 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.

5.2.1 Immunity Compliance Criteria

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

Criteria 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 means votes that have been completed and confirmed to the voter.

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

Electrostatic Disruption

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	2.00, 4.00, 8.00
Indirect Contact: VCP	2.00, 4.00, 8.00
Direct Contact to Metallic Surfaces	2.00, 4.00, 8.00
Air Discharges to Insulated Surfaces	2.00, 4.00, 8.00, 15.00

Deviations from Test Method: None

Exit Criteria: B

5.2.2 *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
80.0 to 1000.0	10	80% AM at 1.0kHz 1% steps with 3s dwell
Clock Frequencies	10	80% AM at 1.0kHz 1% steps with 3s dwell

Deviations from Test Method: None

Exit Criteria: A

5.2.3 *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:

Coupling Mode	Test Voltage +/- kV
AC & DC Line Cord	2.0
All external wires >3m no control	1.0

Deviations from Test Method: None

Exit Criteria: B

5.2.4 *Lightning Surge*

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

Test Levels:

Coupling Mode	Test Voltage +/- kV
Differential Mode	2
Common Mode	2
Differential Mode >10m	0.5
Common Mode >10m	0.5
I/O sig/control >30m	1

Deviations from Test Method: None

Exit Criteria: B

5.2.5 *Conducted RF Immunity*

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

Test Levels:

Test Point	Frequency Range (MHz)	Test Level (Vrms)	Modulation / Sweep
AC & DC Power >3m in length	0.150Khz to 80Mhz	10	80% AM at 1.0Khz 1% steps with 3s dwell
I/O cables >3M in length	Clock Frequencies	10	80% AM at 1.0Khz 1% steps with 3s dwell

Deviations from Test Method: None

Exit Criteria: A

5.2.6 *Magnetic Fields Immunity*

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

Test Levels: 30 A/m at 60 Hz

Deviations from Test Method: None

Exit Criteria: A

5.2.7 *Electrical Power Disturbance*

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

Test Levels:

Electrical Power Disturbance
30% dip @ 10ms
60% dip @ 100 ms and 1 sec
> 95% interrupt @ 5 sec
Surges of ±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 Criteria: A

6.0 Handling Hardware Anomalies and Incidents

6.1 Hardware Test Anomalies

An anomaly with the subcontractor's test equipment or a procedural misstep can cause a test to fail. For any suspected test equipment issue or procedural error, analysis will be performed and the decision whether to continue testing based on the severity of the anomaly will be appropriately tracked. The subcontractor test lab will issue a corrective action to address any test equipment and/or procedure errors. This is part of the hardware test subcontractor's quality system process that allows the hardware test lab to train all personnel, repair/calibrate equipment, and prevent any recurrence.

6.2 Hardware Incident Process

For every test failure of any voting system component at the hardware test lab, the lab completes a data sheet (per their laboratory procedures and templates) and immediately informs the SLI Hardware Specialist. This can be communicated in the daily status update, with the data sheet attached.

- Failure Analysis: Once a failure has occurred, the SLI Hardware Specialist will be involved with the subcontractor test lab(s) to identify the hardware discrepancy in the device. The results of the analysis will be documented and tracked in the discrepancy reporting tool, and the ECO database under Hardware Incident. The analysis will focus on the failure, what caused the failure, the severity (minor or major), and possible impacts to other testing.
- Mitigation: The SLI Hardware Specialist monitors any work done by the manufacturer, with the full understanding of what is occurring and why.
    - The Manufacturer will document what work is done and the SLI Hardware Specialist will sign off on or can stop the work at any time.
    - The Hardware Specialist will determine the number of "minor" fixes the manufacturer can incorporate without a re-start of the test.
    - A **minor** change made by the manufacturer can include grounding the chassis or adding ferrites.
    - Any **major** component replacement is cause for failing a test and requiring a re-start. Example: Bad motherboard. Analysis: What was the cause; did the ESD test cause the motherboard to malfunction? Does this impact other hardware tests? The Manufacturer can only replace like for like components and this process must be monitored by the SLI Hardware Specialist.
    - Any modification to the equipment is followed up with the related manufacturer EC(s). All related ECs must be entered into the hardware test report and the certification test report

When issues are identified during hardware environmental testing, they result in discrepancies. Discrepancies are tracked in the ECO database under the "Hardware Test Incident" category. The incident number will be tracked along with the equipment that is taken out of testing due to the failure.

APPENDIX I

EMI Test Log

emc integrity incorporated

EMI Test Log

Manufacturer:	SLI Global Solutions	Project Number:	B41002
Model:	2005352 (Touch Writer) Rev. B	S/N:	W1400006609 W1400007609
Customer Representative:	Darrick Forester		
Standard Referenced:	FCC Part 15		

FR0105

10m Emissions

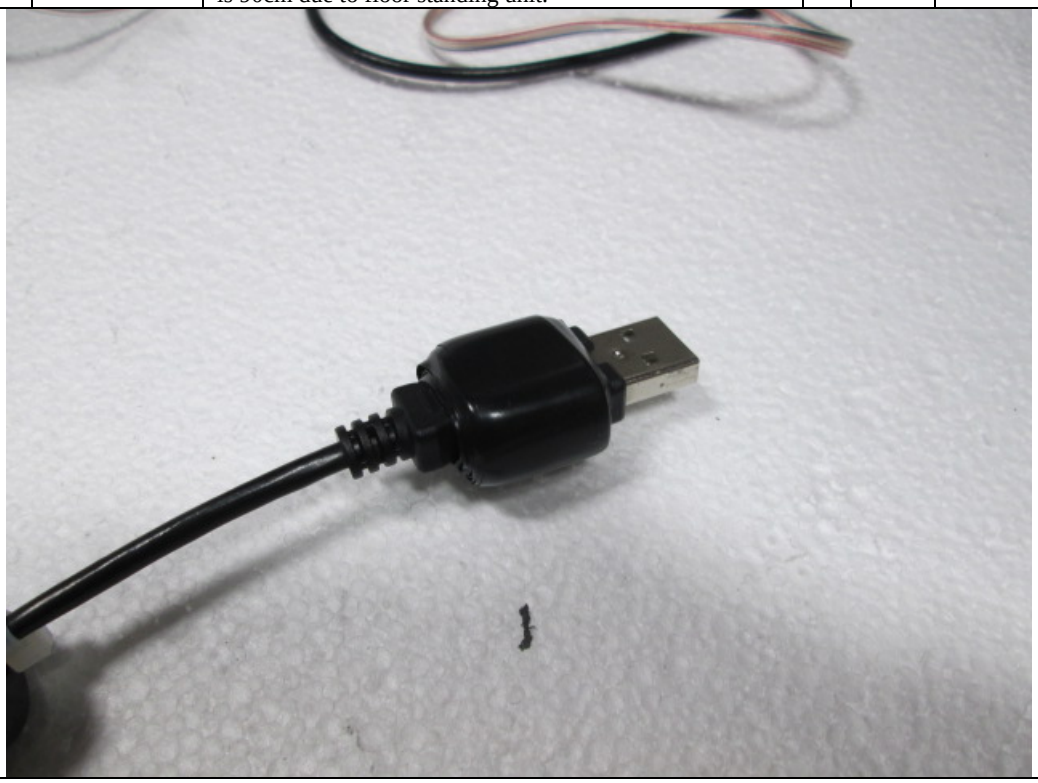
Test	Test Code	Date	Event	OT	Time (hrs)	Result	Initials
	6001	October 1, 2014 0800-0900	Radiated Emissions Engineering / Trouble-Shooting		1.0	Complete	MT
RE	1342	0900-0945	Test #1: Radiated Emissions, 30 MHz - 1 GHz, 8 Rads, 4 Heights, 3 sec. dwell, ref. level = 80 dBuV, 10 meter distance 120 VAC / 60 Hz Printer stopped printing will rerun scan		0.75	---	MT
		0945-1130	Test #2: Radiated Emissions, 30 MHz - 1 GHz, 8 Rads, 4 Heights, 3 sec. dwell, ref. level = 80 dBuV, 10 meter distance 120 VAC / 60 Hz		1.75	Pass	MT
Client requested testing be completed to 10 GHz not 6 GHz as quoted							
RE	1341	1130-1200	Test #3: Radiated Emissions, 1 GHz - 10 GHz, 16 Rads, 2 Heights, 3 sec. dwell, ref. level = 107 dBuV, 3 meter distance 120 VAC / 60 Hz		0.5	---	MT
		1200-1230	Lunch		---	---	MT
		1230-1300	Continue: Test #3: Radiated Emissions, 1 GHz - 10 GHz, 16 Rads, 2 Heights, 3 sec. dwell, ref. level = 107 dBuV, 3 meter distance 120 VAC / 60 Hz		0.5	Pass	MT
CE	2341	1300-1330	Test #4: Conducted Emissions, 150 kHz - 30 MHz 120 VAC / 60 Hz		0.5	Pass	MT
Client made some modifications after initial testing was completed: Wrapped 3 sides of power brick with Lexan Label Install new brick plate with clear Lexan label New EUT S/N W1400007609 Client requested to rerun scans							
RE	1341	October 22, 2014 1300-1400	Test #5: Radiated Emissions, 1 GHz - 10 GHz, 16 Rads, 2 Heights, 3 sec. dwell, ref. level = 107 dBuV, 3 meter distance 120 VAC / 60 Hz		1.0	Pass	MT

10m Emissions

Test	Test Code	Date	Event	OT	Time (hrs)	Result	Initials
RE	6002	1400	Test #6: Radiated Emissions, 30 MHz - 1 GHz, 8 Rads, 4 Heights, 3 sec. dwell, ref. level = 80 dBuV, 10 meter distance 120 VAC / 60 Hz EUT Failed @ 960 MHz. Changed USB "V" drive will rescan		---	Fail	MT
RE		1600	Test #7: Radiated Emissions, 30 MHz - 1 GHz, 8 Rads, 4 Heights, 3 sec. dwell, ref. level = 80 dBuV, 10 meter distance 120 VAC / 60 Hz		2.0	Fail	MT
RE	1342	October 29, 2014 1100-1200	Test #8: Radiated Emissions, 30 MHz - 1 GHz, 8 Rads, 4 Heights, 3 sec. dwell, ref. level = 80 dBuV, 10 meter distance 120 VAC / 60 Hz All LEDs on. On back of device, Tied Digital ground to chassis ground.		1.0	---	MT
		1200-1230	Lunch		---	---	MT
RE		1230-1330	Continue: Test #8: Radiated Emissions, 30 MHz - 1 GHz, 8 Rads, 4 Heights, 3 sec. dwell, ref. level = 80 dBuV, 10 meter distance 120 VAC / 60 Hz All LEDs on. On back of device, Tied Digital ground to chassis ground. EUT Failed @ 840 MHz		1.0	Fail	MT
RE	6001	1330-1430	RE Trouble shooting		1.0	Complete	MT
RE	6002	1430-1500	Test #9: Radiated Emissions, 30 MHz - 1 GHz, 8 Rads, 4 Heights, 3 sec. dwell, ref. level = 80 dBuV, 10 meter distance 120 VAC / 60 Hz Replaced USB "V" drive, Reroute internal cable		0.5	Complete	MT
RE		1500-1630	Test #10: Radiated Emissions, 30 MHz - 1 GHz, 8 Rads, 4 Heights, 3 sec. dwell, ref. level = 80 dBuV, 10 meter distance 120 VAC / 60 Hz Replaced USB "V" drive and "C FAST", Not running platform manager		1.5	Fail	MT
RE	1342	November 7, 2014 1230-1400	Test #11: Radiated Emissions, 30 MHz - 1 GHz, 8 Rads, 4 Heights, 3 sec. dwell, ref. level = 80 dBuV, 10 meter distance 120 VAC / 60 Hz		1.5	Pass	MT
RE	1342	1400-1530	Test #12: Radiated Emissions, 1 GHz - 10 GHz, 16 Rads, 2 Heights, 3 sec. dwell, ref. level = 107 dBuV, 3 meter distance 120 VAC / 60 Hz		1.5	Pass	MT

Regular hours:	16.0
Overtime/Prem hours:	
Total hours:	16.0

Ground Planes / CALC

Test	Test Code	Date	Event	OT	Time (hrs)	Result	Initials
4-3	4354	October 1, 2014 1430 - 1530	Equipment Setup		1.0	---	CL
---	---	1530 - 1630	Radiated RF Immunity 10V/m, 80 - 1000 MHz, 1% Step, 80% AM, 1kHz sine, 3s dwell 120 VAC / 60 Hz Note:.		1.0	---	CL
---	---	October 2, 2014 0800 - 1200	Radiated RF Immunity 10V/m, 80 - 1000 MHz, 1% Step, 80% AM, 1kHz sine, 3s dwell 120 VAC / 60 Hz		4.0	Pass	CL
4-6	4622	1230 - 1400	Conducted RF Immunity 10Vrms, 0.15 - 80 MHz, 1% Step, 80% AM, 1kHz sine, 3s dwell (AC main & No I/O >3m) 120 VAC / 60 Hz Note: Distance between UUT and CDN is 90cm due to floor standing unit.		1.5	Pass	CL/TW
							
Modification to UUT, added electrical tape to USB cable connector.							
4-4	4411	1400 - 1630	Electrical Fast Transient / Burst Mains: +/- 2kV, I/O: +/- 1kV, rep rate 100 kHz. (AC main & No I/O >3m) **120 VAC / 60 Hz Note: Test was re-started several times due to UUT not printing, setup changed to include support equipment on a stand and be on the left side of the UUT.**		2.5	Fail	CL/TW
---	---	---	Note: Line1 -2kV UUT stopped printing. On 100kHz waveform.			---	CL/TW
---	---	---	Note: Line2 -2kV UUT stopped printing. Running 5kv waveform			---	CL/TW

Ground Planes / CALC

Test	Test Code	Date	Event	OT	Time (hrs)	Result	Initials
---	---	---	Changed to a standard USB cable hooked from UUT to Printer.			---	CL/TW
---	---	October 3, 2014 0800 - -0930	Troubleshooting EFT failure. Ran 100 rep rate on L1,L2 & PE and failed. Switched to 5kHz rep rate on L1, L2 & PE. And failed. Switched to 1 kHz rep rate on L1, L2 & PE, failed. Switched to 2000V 100 kHz rep rate. Unit passed New UUT s/n: W1400007309		1.5	Fail	CL/MN
4-11	4191	0930 - 1330	Voltage Dips and Interruptions Electric power increases of 7.5% and reductions of 12.5% of nominal specified power. (See Protocol) TBD Completed the +7.5% of nominal 120V		4.0	Pass	CL/MN
---	---	1330 - 1400	Lunch		---	---	MN
4-11	4191	1430 -1530	Voltage Dips and Interruptions 70% nom, 0.5 cycles / 40% nom, 5 cycles / 0% nom, 250 cycles (See Protocol for Specifics) 120 VAC / 60 Hz		1.0	Pass	MN
		October 6, 2014 0800-1130	Voltage Dips and Interruptions Electric power increases of 7.5% and reductions of 12.5% of nominal specified power. (See Protocol) TBD Run -12.5% of 120VAC voltage variance (105VAC)		4.0	Pass	DW
		1130-1200	Voltage Dips and Interruptions Surges of +15% line variations of nominal line voltage. (See Protocol) TBD		0.5	Pass	DW
		1210-1230	Lunch		---	---	DW
4-8	4831	1230-1330	Power Frequency H-Field Immunity 30A/m, 50 / 60 Hz, 3 axes 120 VAC / 60 Hz		1.0	Pas	DW
4-2	4295	1330-	Electrostatic Discharge +/- 2, 4, 8kV Contact, +/-2, 4, 8, 15kV Air (See Protocol for Specifics) 120 VAC / 60 Hz		---	---	DW
			Contac discharges to UUT (unsure of test point) caused printer to stop printing. Client replaced printer, rebooted UUT and could not repeat error..		---	---	DW
		1430	-15kV to seam on side of power brick caused printer to stop printing. Could not recover. Printer fail.		---	---	DW
	5002	1430-1630	Conducted Immunity & ESD Engineering / Trouble-Shooting Engineering / Trouble-Shooting --		2.0	---	DW
		October 7, 2014 0800-	Continued ESD testing.		---	---	DW
			-15kV air to side seam of power brick passed.		---	---	DW
			-15kVair to LED on power brick caused printer error.		---	---	DW
			USB Printer Cables below		---	---	DW

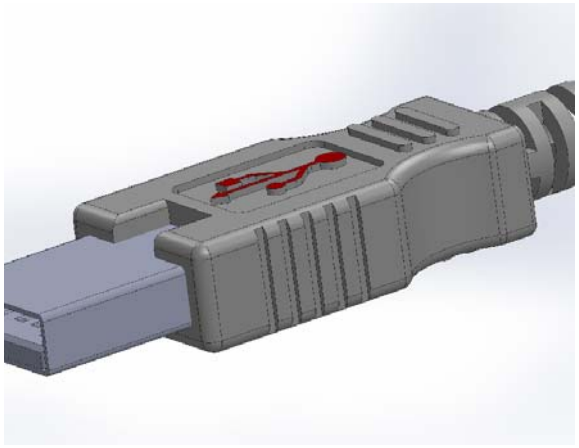
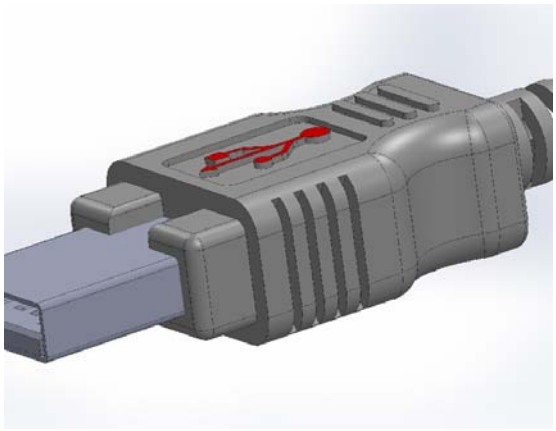
Ground Planes / CALC

Test	Test Code	Date	Event	OT	Time (hrs)	Result	Initials
					---	---	DW
			-8kV air to USB cable at UUT caused printer to fail.		---	---	DW
		0930	ESD testing/troubleshooting complete.		1.5	Fail	DW
4-5	4596	0930-	Surge Immunity Mains: +/- 2kV CM, +/- 2kV DM, (0, 90, 180, 270) (See Protocol for Specifics) 120 VAC / 60 Hz		---	---	DW
		1330	Printer failed at +2kV L1-PE 90 deg.		4.0	Fail	DW

Regular hours:	29.5
Overtime/Prem hours:	
Total hours:	29.5

Change Order #: CO2014071804_A							
4-4	4411	October 23, 2014 0800 - 1000	Electrical Fast Transient / Burst (Re-test) Mains: +/- 2kV, I/O: +/- 1kV, rep rate 100 kHz. (AC main & No I/O >3m) 120 VAC / 60 Hz		2.0	Pass	MN

					---	---	MN

---	---	---	Electrical tape on usb. New usb cables are being manufactured with a plastic shell to duplicate the thickness of the electrical tape. **This is the before and after drawings of the printer usb cable rubber for your formal test report.** **Tom Farley will simulate this with electrical tape for our testing going forward starting with Conducted RF Immunity.** **Best Regards,** **Darrick**   Only running L1,L2,PE , not individual tests.		---	---	MN
4-5	4596	October 23, 2014 1000 - 1530	Surge Immunity (Re-test) Mains: +/- 2kV CM, +/- 2kV DM, (0, 90, 180, 270) (See Protocol for Specifics) 120 VAC / 60 Hz		5.5	Pass	MN
---	---	---	EMC Pro is 110cm from UUT		---	---	MN

4-2	4295	October 24, 2014 0800 - 1130	Electrostatic Discharge (Re-test) +/- 2, 4, 8kV Contact, +/-2, 4, 8, 15kV Air (See Protocol for Specifics) 120 VAC / 60 Hz		3.5	Pass	MN
---	---	---	Pretest OK, ground cables 951 and 915 Ohms		---	---	MN

Regular hours:	11.0
Overtime/Prem hours:	
Total hours:	11.0

APPENDIX J

Laboratory Accreditations

Nemko Laboratory Authorization

Authorization: ELA 215

EMC Laboratory: **EMC Integrity, Inc.**
1736 Vista View Drive
Longmont, Colorado 80504
USA

Scope of Authorization: **All CENELEC standards [ENs] for EMC that are listed on the accompanying page, and all of the corresponding CISPR, IEC and ISO EMC standards that are listed on the accompanying page.**

Nemko has assessed the quality assurance system, the testing facilities, qualifications and testing practices of the relevant parts of the organization. The quality assurance system of the Laboratory has been validated against ISO/IEC 17025 or equivalent. The laboratory also fulfils the conditions described in Nemko Document NLA -10. During the visit by the Nemko representative it was found that the Laboratory is capable of performing tests within the Scope of the Authorisation.

Accordingly, Nemko will normally accept test results from the laboratory on a partial or complete basis for certification of the products.

In order to maintain the Authorisation, the information given in the pertinent NLA-10 must be carefully followed. Nemko is to be promptly notified about any changes in the situation at the Laboratory, which may affect the basis for this Authorisation. The Authorisation may be withdrawn at any time if the conditions are no longer considered to be fulfilled.

The Authorisation is valid through June 30, 2015.

Dallas, Texas, USA.

For and on behalf of Nemko AS:

T.B. Ketterling,
Nemko ELA Co-ordinator
Region: North America

SCOPE OF AUTHORIZATION

Capability to perform a basic test implies also that any product (family) standard calling up this basic test is also within the scope if mentioned below or not.

Generic & Product –Family Standards		
EN 55011 :1998+A1 :1999 +A2 :2002 EN 55011:2007 +A2:2007 EN 55011:2009 +A1:2010 CISPR 11:1997 (Modified) + A1:1999 + A2:2002 CISPR 11 Ed. 4.1 CISPR 11 Ed 5.1 (2010-7)	EN55014:1997 +A1:2008 EN 55014-1:2006 +A1:2009 EN 55014-1:2000 + A1:2001 + A2:2002 CISPR 14-1:2000 + A1:2001 + A2:2002 CISPR 14-1:2005 +A1:2008 CISPR 14-1 Ed. 5.0	EN 55014-2:1997 + A1:2001 CISPR 14-2:1997 + A1:2001 +A2:2008 CISPR 14-2 Ed. 1.2
EN 55022: 1998+ A1:2000, +A2:2003 CISPR 22: 2003+ A1:2004 CISPR 22:2005 (Modified) EN55022:2006 CISPR 22 Ed. 5.2 CISPR 22 Ed. 6.0 (2008-09) EN 55022 +A1: 2007 EN 55022:2010	EN 55024: 1998 +A1:2001, +A2:2003 CISPR 24: 1997 +A1:2001, +A2:2002 CISPR 24 Ed. 1.0 EN 55024:2010	EN 61000-6-1 :2007 IEC 61000-6-1 Ed. 2.0 EN 61000-6-1: 2001
EN 61000-6-2:2005 IEC 61000-6-2 Ed. 2.0	EN 61000-6-3 :2007 IEC 61000-6-3 Ed. 2.0 EN 61000-6-3: 2001 + A1 :2004	IEC 61000-6-2 Ed. 2.0 EN 61000-6-2: 2005 IEC 61000-6-2: 2005 EN 61000-6-2: 2001
EN 61326:1997 +A1:1998 + A2:2001 +A3:2003 IEC 61326:1997 + A1:1998 + A2:2000 EN 61326-1 Ed. 1.0 EN 61326-1 :2013 IEC 61326-1 Ed. 2.0 (2012-07) IEC 61326:2006	EN 60601-1-2:2001 + A1:2006 IEC 60601-1-2:2001 EN 60601-1-2:2007 IEC 60601-1-2:2007 (Ed. 3.0)	EN 55103-1:1996 EN 55103-2 :1996 EN 55103-1:2005 EN 55103-2:2005
EN 300 386 V.1.3.1 EN 300 386 V.1.3.3 EN 300 386 V.1.4.1	EN 61000-3-3: 1995, +A1:2001 +A2:2005 IEC 61000-3-3: 1994, +A1:2001 +A2:2005 EN 61000-3-3:2008	EN 61000-3-2: 2000 +A2 :2005 IEC 61000-3-2: 2000 (Modified) +A1:2001 +A2:2004 EN 61000-3-2:2006
EN 50130-4: 1995 + A1:1998 + A2:2002 EN 50130-4:2011	ETSI EN 301 489-x ETSI EN 300 220-x	ETSI EN 300 339 Ed. 1

TBKetterling

T.B. Ketterling, Nemko ELA Co-ordinator

2(3)

NLA 3 ED3

Basic Standards		
EN 61000-4-2:1995, +A1:1998, +A2:2000 IEC 61000-4-2:1995, +A1:1998, +A2:2000 EN 61000-4-2 : 2009 EN 61000-4-2 :2008 (ed. 2) IEC 61000-4-2:2001 (ed. 1.2)	EN 61000-4-3:2002, +A1:2002 IEC 61000-4-3:2002, +A1:2002 EN 61000-4-3 :2006 +A1 :2006 +A2 :2006 IEC 61000-4-3 (Ed. 3.0) +A1 :2007 +A2 :2010	EN 61000-4-4:1995, +A1:2002, +A2:2002 IEC 61000-4-4:1995, +A1:2000, +A2:2001 EN 61000-4-4:2004 IEC 61000-4-4 Ed. 2.0 IEC 61000-4-4:2012
EN 61000-4-5:1995, +A1:2001 IEC 61000-4-5:1995, +A1:2000 EN 61000-4-5 :2006 IEC 61000-4-5 Ed. 2.0	EN 61000-4-6:1996, +A1:2001 IEC 61000-4-6:1996, +A1:2000 EN 61000-4-6 : 2009 IEC 61000-4-6 Ed. 2.2 IEC 61000-4-6 :2008	EN 61000-4-8:1994,+A1:2001 IEC 61000-4-8:1994, +A1:2001 IEC 61000-4-8 Ed. 1.1 IEC 61000-4-8 :2001 IEC 61000-4-8 :2009 EN 61000-4-8 :2010
EN 61000-4-11:2004 IEC 61000-4-11 Ed. 2.0 EN 61000-4-11:1994, +A1:2000 IEC 61000-4-11:1994, +A1:2000	BLANK	BLANK

TBKetterling T.B. Ketterling, Nemko ELA Co-ordinator

3(3) NLA 3 ED3

United States Department of Commerce
National Institute of Standards and Technology

NVLAP®

Certificate of Accreditation to ISO/IEC 17025:2005

NVLAP LAB CODE: 200737-0

EMC Integrity, Inc.
Longmont, CO

is accredited by the National Voluntary Laboratory Accreditation Program for specific services, listed on the Scope of Accreditation, for:

ELECTROMAGNETIC COMPATIBILITY AND TELECOMMUNICATIONS

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to joint ISO-ILAC-IAF Communique dated January 2009).

2014-07-01 through 2015-06-30
Effective dates

For the National Institute of Standards and Technology

NVLAP-01C (REV. 2009-01-28)

NVLAP® National Voluntary Laboratory Accreditation Program

SCOPE OF ACCREDITATION TO ISO/IEC 17025:2005

EMC Integrity, Inc.
1736 Vista View Drive
Longmont, CO 80504
Mr. Vincent W. Greb
Phone: 303-776-7249 Fax: 303-776-7314
E-Mail: vinceg@emcintegrity.com
URL: http://www.emcintegrity.com

ELECTROMAGNETIC COMPATIBILITY AND TELECOMMUNICATIONS

NVLAP LAB CODE 200737-0
Scope Revised: 2014-10-06

NVLAP Code	*Designation / Description*
Emissions Test Methods	
12/100063c	IEC 61000-6-3 (1996), EN 61000-6-3 (2001), A1 (2004): Electromagnetic Compatibility (EMC) - Part 6: Generic standards - Section 3: Emission standard for residential, commercial, and light-industrial environments.
12/610006m	EN 61000-6-4 (2007): Electromagnetic Compatibility (EMC) - Part 6-4: Generic Standards - Emission Standard for Industrial Environments
12/61326da	IEC 61326-1 Ed. 2.0 (2012): Electrical equipment for measurement, control and laboratory use - EMC requirements - Part 1: General requirements
12/CIS11f	AS/NZS CISPR 11 (2002): Industrial, scientific and medical (ISM) radio frequency equipment - Electromagnetic disturbance characteristics - Limits and methods of measurement
12/CIS11g	IEC/CISPR 11, Ed. 4.1 (2004-06): Industrial, scientific and medical (ISM) radio-frequency equipment - Electromagnetic disturbance characteristics - Limits and methods of measurements
12/CIS11h	AS/NZS CISPR 11 (2004): Industrial, scientific and medical (ISM) radio frequency equipment - Electromagnetic disturbance characteristics - Limits and methods of measurement
12/CIS11i	IEC/CISPR 11, Ed. 4.1 (2004-06) + A1(2004): Industrial, scientific and medical (ISM) radio frequency equipment - Electromagnetic disturbance characteristics - Limits and methods of measurement

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12/CIS11j	EN 55011 (1998) + A1(1999), A2(2002): Industrial, scientific and medical (ISM) radio frequency equipment - Electromagnetic disturbance characteristics - Limits and methods of measurement
12/CIS11k	IEC/CISPR 11 (2003), EN 55011 (1998), A2(2002): Limits and Methods of Measurement of Electromagnetic Disturbance Characteristics of Industrial, Scientific, and Medical Radio-Frequency Equipment
12/CIS11m2	EN 55011 (2009) + A1 (2010): Industrial, scientific and medical (ISM) radio-frequency equipment - Electromagnetic disturbance characteristics - Limits and methods of measurement
12/CIS11p	IEC/CISPR 11 Ed. 5 (2009-05): Industrial, scientific and medical equipment - Radio-frequency disturbance characteristics - Limits and methods of measurement
12/CIS14b1	AS/NZS CISPR 14-1 (2003): Electromagnetic Compatibility - Requirements for household appliances, electric tools and similar apparatus - Part 1: Emission
12/CIS14x	IEC/CISPR 14-1, Ed. 4 (2003): Electromagnetic Compatibility - Requirements for household appliances, electric tools and similar apparatus - Part 1: Emission
12/CIS22	IEC/CISPR 22 (1997) & EN 55022 (1998) + A1(2000): Limits and methods of measurement of radio disturbance characteristics of information technology equipment
12/CIS22a	IEC/CISPR 22 (1993) and EN 55022 (1994): Limits and methods of measurement of radio disturbance characteristics of information technology equipment, Amendment 1 (1995) and Amendment 2 (1996)
12/CIS22a4	IEC/CISPR 22 (1993) & EN 55022 (1994)+A1(1995), A2(1997): Limits and methods of measurement of radio disturbance characteristics of information technology equipment
12/CIS22b	CNS 13438 (1997): Limits and Methods of Measurement of Radio Interference Characteristics of Information Technology Equipment
12/CIS22c	IEC/CISPR 22, Fourth Edition (2003-04) & EN 55022 (1998): Information technology equipment - Radio disturbance characteristics - Limits and methods of measurement

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12/CIS22c1	IEC/CISPR 22, Edition 5 (2005) and EN 55022 (1998): Information technology equipment - Radio disturbance characteristics - Limits and methods of measurement
12/CIS22c3	IEC/CISPR 22, Edition 5 (2005) + A1(2005): Information technology equipment - Radio disturbance characteristics - Limits and methods of measurement
12/CIS22c4	EN 55022 (1998) + A1(2000) + A2(2003): Information technology equipment - Radio disturbance characteristics - Limits and methods of measurement
12/CIS22f	CNS 13438 (2006) (up to 6GHz): LImits and Methods of Measurement of Radio Interference Characteristics of Information Technology Equipment
12/CIS22i	IEC/CISPR 22, Edition 5.2 (2006-03): Limits and Methods of Measurement of Radio Disturbance Characteristics of Information Technology Equipment
12/CIS22j	EN 55022 (2006): Information technology equipment - Radio disturbance characteristics - Limits and methods of measurement
12/CIS22j1	EN 55022 (2006) + A1 (2007): Information technology equipment - Radio disturbance characteristics - Limits and methods of measurement
12/CIS22j2	EN 55022:2010: Information technology equipment. Radio disturbance characteristics. Limits and methods of measurement
12/CIS22k	IEC/CISPR 22 (2008-09): Limits and Methods of Measurement of Radio Disturbance Characteristics of Information Technology Equipment
12/CIS32a	CISPR 32, Ed. 1 (2012-01): Electromagnetic compatibility of multimedia equipment - Emission requirements
12/CIS32ba	EN 55032:2012/AC:2013: Electromagnetic compatibility of multimedia equipment. Emission requirements
12/EM02d	IEC 61000-3-2, Edition 2.2 (2004-11): Electromagnetic compatibility (EMC) - Part 3-2: Limits - Limits for harmonic current emissions (equipment input current <= 16 A per phase)

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NVLAP Code	*Designation / Description*
12/EM02k	GB 17625.1 (2003): Electromagnetic compatibility (EMC) - Part 3: Limits - Section 2. Limits for harmonic current emissions (equipment input current <= 16A per phase)
12/EM03b	IEC 61000-3-3, Edition 1.1(2002-03) & EN 61000-3-3, A1(2001): EMC - Part 3-3: Limits - Limitations of voltage changes, voltage flucuations and flicker, in public low-voltage supply-systems, for equipment with rated current <=16 A per phase and not subject to conditional connections
12/EM03g	IEC 61000-3-3, Edition 1.1 (2003) +A2 (2005): EMC Part 3-3: Limits - Limitations of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems, for equipment with rated current <= 16 A per phase and not subject to conditional connections
12/EM12c	IEC 61000-3-12 Ed. 2.0 (2011): Electromagnetic compatibility (EMC) - Part 3-12: Limits - Limits for harmonic currents produced by equipment connected to public low-voltage systems with input current >16 A and = 75 A per phase
12/EM12d	EN 61000-3-12 (2011): Electromagnetic Compatibility (EMC) - PART 3-12: Limits for harmonic currents produced by equipment connected to public low-voltage systems with input current greater than 16A and less than or equal to 75A
12/F18	FCC OST/MP-5 (1986): FCC Methods of Measurement of Radio Noise Emissions for ISM Equipment (cited in FCC Method 47 CFR Part 18 - Industrial, Scientific, and Medical Equipment)
12/FCC15b	ANSI C63.4 (2003) with FCC Method 47 CFR Part 15, Subpart B: Unintentional Radiators
12/FCC15bb	ANSI C63.4 (2009) with FCC Method 47 CFR Part 15, Subpart B: Unintentional Radiators
12/KN11d1	KN11 (Annex 3) with RRA Announce 2008-11 (Dec. 16, 2008): Conformity Assessment Procedure for Electromagnetic Interference; With KN 11 (Annex 3)
12/KN16	Korea RRA Notice No. 2008-11 (Dec. 16, 2008): Conformity Assessment Procedures for Electromagnetic Interference using KN 16-1-1, KN 16-1-2, KN 16-1-3, KN 16-1-4, KN 16-1-5, KN 16-2-1, KN 16-2-2, KN 16-2-3, KN 16-2-4 (2008-05)

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NVLAP Code	*Designation / Description*
12/KN22	KN22 with RRL Notice No. 2005-82 (Sept. 29, 2005): RRL Notice No. 2005-82: Technical Requirements for Electromagnetic Interference Annex 8 (KN-22), RRL Notice No. 2005-131: Conformity Assessment Procedures for Electromagnetic Interference
12/KN22e	KN22 (2008-5) with RRL Notice No. 2008-3 (May 20, 2008): Conformity Assessment Procedure for Electromagnetic Interference; With KN 22
12/KN22f	KN22 (Annex 5) with RRA Announce 2010-5 (Dec 24, 2010): Conformity Assessment Procedure for Electromagnetic Interference; With KN 22 (Annex 5)
12/RRA04a	RRA 2014-8 and RRA 2014-37 (June 23, 2014): Technical Requirements and Test Methods for Electromagnetic Interference; K only (See specific Annexes listed on scope)
12/RRA105	RRA Announce 2010-5, K only (December 24, 2010): Conformity Assessment Procedure for Electromagnetic Interference (K only)
12/RRA1118	RRA Public Notification 2011-18, K only (July 5, 2011): Technical Requirements for Electromagnetic Interference (K only)
12/T51	AS/NZS CISPR 22 (2002) and AS/NZS 3548 (1997): Electromagnetic Interference - Limits and Methods of Measurement of Information Technology Equipment
12/T51b1	AS/NZS CISPR 22 (2009): Information technology equipment - Radio disturbance characteristics - Limits and methods of measurement
12/TCVNa	TCVN 7189:2009 (CISPR 22:2006): Information Technology Equipment-Radio disturbance characteristics - Limits and methods of measurement
12/VCCIe	Agreement of VCCI V-3 (2009.04): Agreement of Voluntary Control Council for Interference by Information Technology Equipment - Technical Requirements: V-3/2009.04 (radiated disturbance above 1 GHz)
12/VCCIg	Agreement of VCCI V-3 (2011.04): Agreement of VCCI Council - Technical Requirements: V-3/2011.04 (including radiated disturbance above 1 GHz)

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12/VCCIi	Agreement of VCCI V-3 (2013.04): Agreement of VCCI Council - Technical Requirements: V-3/2013.04 (including radiated disturbance above 1 GHz)

Immunity Test Methods

12/610006h	IEC 61000-6-1, 2nd edition (2005-03): Electromagnetic compatibility (EMC) - Part 6: Generic standards - Section 1: Immunity for residential, commercial and light-industrial environments
12/610006i	IEC 61000-6-2, Edition 2.0 (2005-01): Electromagnetic compatibility (EMC) - Part 6-2: Generic standards - Immunity for industrial environments
12/61326aa	EN 61326-1:2013: Electrical equipment for measurement, control and laboratory use - EMC requirements - Part 1: General requirements
12/CIS24g	CISPR 24 ed2.0 (2010-08): Information technology equipment - Immunity characteristics - Limits and methods of measurement
12/CIS24h	EN 55024 (2010): Information technology equipment. Immunity characteristics. Limits and methods of measurement
12/I01b	IEC 61000-4-2 (2001); EN 61000-4-2 (2001), A2 (2001): Electrostatic Discharge Immunity Test
12/I01c	EN 61000-4-2 +A1(1998) +A2(2001): Electrostatic Discharge Immunity Test
12/I01d	IEC 61000-4-2, Ed. 2.0 (2008-12): Electromagnetic compatibility (EMC) - Part 4-2: Testing and measurement techniques - Electrostatic discharge immunity test
12/I01f	EN 61000-4-2 (2009-05): Electromagnetic compatibility (EMC) - Part 4-2 : Testing and measurement techniques - Electrostatic discharge immunity test
12/I02b	IEC/EN 61000-4-3, Ed. 2.1 (2002), A1 (2002); EN 61000-4-3: Radiated, radio-frequency, electromagnetic field immunity test
12/I02c	IEC 61000-4-3 (1995), A1(1998), A2(2000): Radiated, radio-frequency, electromagnetic field immunity test

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12/I02f	EN 61000-4-3 (2002) + A1(2002): Radiated, radio-frequency, electromagnetic field immunity test
12/I02ggg	IEC 61000-4-3, Ed. 3.0 (2006-02) + A1 (2007) + A2 (2010): Electromagnetic compatibility (EMC) - Part 4-3: Testing measurement techniques - Radiated, radio-frequency, electromagnetic field immunity test
12/I02hhh	EN 61000-4-3 (2006) +A1 (2008) + A2 (2010): Electromagnetic compatibility (EMC). Testing and measurement techniques. Radiated, radio- Frequency, electromagnetic field immunity test
12/I03c	IEC 61000-4-4, Ed. 2.0 (2004-07): Electromagnetic compatibility (EMC) - Part 4-4: Testing and measurement techniques - Electrical fast transient/burst immunity test
12/I03e	EN 61000-4-4 (2004): Electromagnetic compatibility (EMC) - Part 4-4: Testing and measurement techniques - Electrical fast transient/burst immunity test
12/I04aa	IEC 61000-4-5, Ed. 2.0 (2005-11); EN 61000-4-5: Electromagnetic Compatibility (EMC) - Part 4-5: Testing and measurement techniques - Surge immunity test
12/I04b	IEC 61000-4-5 (2001), A1(2000); EN 61000-4-5(2001), A1(2000): Surge Immunity Test
12/I04d	BS EN 61000-4-5 (2006): Electromagnetic compatibility (EMC). Testing and measurement techniques. Surge immunity test
12/I05d	IEC 61000-4-6, Ed. 2.1 (2004); EN 61000-4-6: Electromagnetic compatibility (EMC) - Part 4-6: Testing and measurement techniques - Immunity to conducted disturbances, induced by radio-frequency fields
12/I05e	EN 61000-4-6 (1996) + A1 (2001): Immunity to Conducted Disturbances, Induced by Radio Frequency Fields
12/I05f1	IEC 61000-4-6 Ed. 3.0 (2008): Electromagnetic compatibility (EMC) - Part 4-6: Testing and measurement techniques - Immunity to conducted disturbances, induced by radio-frequency fields

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12/I05j	EN 61000-4-6 (2009): Electromagnetic compatibility (EMC) - Part 4-6: Testing and measurement techniques - Immunity to conducted disturbances, induced by radio-frequency fields
12/I06b	IEC 61000-4-8 (2001), A1(2000); EN 61000-4-8 (2001),A1(2000): Power Frequency Magnetic Field Immunity Test
12/I06c	EN 61000-4-8 (1993) + A1 (2001): Power Frequency Magnetic Field Immunity Test
12/I06e	IEC 61000-4-8 (2009): Electromagnetic compatibility (EMC) - Part 4-8: Testing and measurement techniques - Power frequency magnetic field immunity test
12/I06f	EN 61000-4-8:2010: Electromagnetic compatibility (EMC). Testing and measurement techniques. Power frequency magnetic field immunity test
12/I07c	IEC 61000-4-11, Ed. 2 (2004-03) & EN 61000-4-11: Electromagnetic compatibility (EMC) - Part 4-11: Testing and measurement techniques - Voltage dips, short interruptions and voltage variations immunity tests
12/I07e	EN 61000-4-11 (1994), A1 (2001): Voltage Dips, Short Interruptions and Voltage Variations Immunity Tests
12/I07f	EN 61000-4-11 (2004): Voltage Dips, Short Interruptions and Voltage Variations Immunity Tests
12/KN11a	KN 61000-4-11 with RRL Notice No. 2005-130 (Dec 27, 2005): Voltage Dips, Short Interruptions and Voltage Variations Immunity Tests
12/KN11f	KN 61000-4-11 (2008-5); RRL Notice No. 2008-4 (May 20, 2008): Voltage Dips, Short Interruptions and Voltage Variations Immunity Tests
12/KN11h	KN 61000-4-11 (Annex 1-7) RRA Announce 2010-6 (Dec.24, 2010): Conformity Assessment Procedure for EMS (Voltage Dips, Short Interruptions and Voltage Variations Immunity tests)

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12/KN24	KN24 (December 2005) with RRL Notice No. 2005-83: Information Technology Equipment - immunity charateristics - limits and methods of measurements
12/KN24d	KN 24 (2008-5) with RRL Notice No. 2008-4 (May 20, 2008): Information Technology Equipment - immunity charateristics - limits and methods of measurements
12/KN24e	KN 24 (Annex 5) with RRA Announce 2010-6 (Dec. 24, 2010): Conformity Assessment Procedure for EMS (Information technology equipment - Immunity characteristics - Limits and methods of measurement)
12/KN2a	KN 61000-4-2 with RRL Notice No. 2005-130 (Dec. 27, 2005): Electrostatic Discharge Immunity Test
12/KN2c	KN 61000-4-2 (2008-5); RRL Notice No. 2008-4 (May 20, 2008): Electrostatic Discharge Immunity Test
12/KN2e	KN 61000-4-2 (Annex 1-1) RRA Announce 2010-6 (Dec. 24, 2010): Conformity Assessment Procedure for EMS (Electrostatic Discharge Immunity Test)
12/KN3a	KN 61000-4-3 with RRL Notice No. 2005-130 (Dec. 27, 2005): Radiated, radio-frequency, electromagnetic field immunity test
12/KN3c	KN 61000-4-3 (2008-5); RRL Notice No. 2008-4 (May 20, 2008): Radiated, radio-frequency, electromagnetic field immunity test
12/KN3e	KN 61000-4-3 (Annex 1-2) RRA Announce 2010-6 (Dec. 24, 2010): Radiated, radio-frequency, electromagnetic field immunity test
12/KN4a	KN 61000-4-4 with RRL Notice No. 2005-130 (Dec. 27, 2005): Electromagnetic compatibility (EMC): Testing and measurement techniques - Electrical Fast Transient/Burst Immun
12/KN4c	KN 61000-4-4 (2008-5); RRL Notice No. 2008-5 (May 20, 2008): Electromagnetic compatibility (EMC): Testing and measurement techniques - Electrical Fast Transient/Burst Immunity Test

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12/KN4e	KN 61000-4-4 (Annex 1-3) RRA Announce 2010-6 (Dec. 24, 2010): Electromagnetic compatibility (EMC): Testing and measurement techniques - Electrical Fast Transient/Burst Immunity Test
12/KN5a	KN 61000-4-5 with RRL Notice No. 2005-130 (Dec. 27, 2005): Surge Immunity Test
12/KN5c	KN 61000-4-5 (2008-5); RRL Notice No. 2008-4 (May 20, 2008): Surge Immunity Test
12/KN5e	KN 61000-4-5 (Annex 1-4) RRA Announce 2010-6 (Dec. 24, 2010): Conformity Assessment Procedure for EMS (Surge Immunity Test)
12/KN6a	KN 61000-4-6 with RRL Notice No. 2005-130 (Dec. 27, 2005): Electromagnetic compatibility (EMC): Testing and measurement techniques - Immunity to conducted disturbances,
12/KN6c	KN 61000-4-6 (2008-5); RRL Notice No. 2008-4 (May 20, 2008): Electromagnetic compatibility (EMC): Testing and measurement techniques - Immunity to conducted disturbances, induced by radio-frequency fields
12/KN6e	KN 61000-4-6 (Annex 1-5) RRA Announce 2010-6 (Dec. 24, 2010): Electromagnetic compatibility (EMC): Testing and measurement techniques - Immunity to conducted disturbances, induced by radio-frequency fields
12/KN8a	KN 61000-4-8 with RRL Notice No. 2005-130 (Dec. 27, 2005): Power Frequency Magnetic Field Immunity Test
12/KN8c	KN 61000-4-8 (2008-5); RRL Notice No. 2008-4 (May 20, 2008): Power Frequency Magnetic Field Immunity Test
12/KN8e	KN 61000-4-8 (Annex 1-6) RRA Announce 2010-6 (Dec. 24, 2010): Conformity Assessment Procedure for EMS (Power Frequency Magnetic Field Immunity Test)
12/RRA04b	RRA 2014-09 and RRA 2014-38 (June 23, 2014) K only: Technical Requirements and Test Methods for Electromagnetic Susceptibility; Korean only (See specific annexes listed on scope)

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12/RRA106	RRA Public Notification 2010-6, December 24, 2010 (K only): Conformity Assessment Procdure for Electromagneitc Susceptibility (K only)
12/RRA1117	RRA Public Notification 2011-17, K only (July 5, 2011): Technical Requirements for Electromagnetic Susceptibility, K only

Product Safety Test Methods

12/60601ab	IEC 60601-1-2, Ed. 3.0 (2007): Medical electrical equipment - Part 1-2: General requirements for safety - Collateral standard: Electromagnetic compatibility - Requirements and tests
12/60601ac	KN 60601-1-2 (2008-5); RRL Notice No. 2008-4 (May 20, 2008): Medical electrical equipment - Part 1-2: general requirements for safety - collateral standard: electromagnetic compatibility - requirements and tests
12/60601h1	EN 60601-1-2 (2007): Medical electrical equipment - Part 1-2: General requirements for safety - Collateral standard: EMC - Requirements and tests

MIL-STD-462 : Conducted Emissions

12/A20	MIL-STD-461 Version F Method CE102
12/A21	MIL-STD-461 Version F Method CE106

MIL-STD-462 : Radiated Emissions

12/D11	MIL-STD-461 Version F Method RE102
12/D12	MIL-STD-461 Version F Method RE103

MIL-STD-462 : Radiated Susceptibility

12/E16	MIL-STD-461 Version F Method RS103

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