

National Technical Systems Test Report for Electromagnetic Interference (EMI) Testing of the DS950

Prepared For

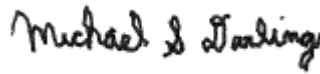
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Revision History

Rev.	Description	Issue Date
0	ITR-PR120980	10/29/2020

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1.0 Introduction

This document presents the test procedures used and the results obtained during the performance of an Electromagnetic Interference test program. The test program was conducted to assess the ability of the specified Equipment Under Test (EUT) to successfully satisfy the requirements listed in Section 2.0.

2.0 References

The following references listed below form a part of this document to the extent specified herein.

- Pro V&V, Inc. Purchase Order(s) 2020-004, dated 07/01/2020
- National Technical Systems (NTS) Quote(s) OP0554725, dated 06/24/2020
- NTS Corporate Quality Policy Manual, Revision 9, dated 9/20/2018
- ISO/IEC 17025:2017(E) *General Requirements for the Competence of Testing and Calibration Laboratories*, dated 11/1/2017
- Test Specification: See Table 5.0-1

3.0 Product Selection and Description

Pro V&V, Inc. selected and provided the test sample(s) to be used as the Equipment Under Test. Details below:

Table 3.0-1: Product Identification - Equipment Under Test (EUT)

Item	Qty.	Name/Description	Part Number	Serial Number
1	1	DS950	DS950	DS9520070511

3.1 Security Classification

Non-classified

4.0 General Test Requirements

4.1 Test Equipment

NTS-provided equipment is calibrated according to ISO/IEC 17025:2017(E) and calibration is traceable to the National Institute of Standards and Technology (NIST). Calibration records are maintained on file at NTS.

4.2 Measurement Uncertainties

Measurement uncertainty data is available upon request.

4.3 Notice of Deviation

In accordance with NTS' quality procedures, when the EUT is observed to exceed or display susceptibility, a Notice of Deviation (NOD) document is generated by the technician performing the test. This NOD documents the requirement, how the EUT deviated from the requirement, and allows room for resolution of the deviation.

This document is reviewed and approved by the NTS Program Manager or Engineer and the NTS Quality Assurance Representative, and then forwarded to the customer contact. Once mitigated (or passed over), the steps taken to correct the deviation (or simply instruction from the customer to continue testing) are recorded in the NOD and a copy of the NOD is integrated into the body of the report, in the appropriate location.



5.0 Test Descriptions and Results

Table 5.0-1: Summary of Test Information & Results

Section	Test	Specification	Test Facility	Test Date	Part #	Serial #	Test Result*
5.1	Electrostatic Discharge	EAC 2005 VVSG	Longmont	09/16/2020 - 09/16/2020	DS950	DS9520070511	Complied
5.2	Radiated RF Immunity	IEC 61000-4-3	Longmont	09/09/2020 - 09/09/2020	DS950	DS9520070511	Complied
5.3	Electrical Fast Transient / Burst	IEC 61000-4-4	Longmont	09/10/2020 - 09/10/2020	DS950	DS9520070511	Complied
5.4	Surge Immunity	IEC 61000-4-5	Longmont	09/15/2020 - 09/15/2020	DS950	DS9520070511	Complied
5.5	Conducted RF Immunity	IEC 61000-4-6	Longmont	09/09/2020 - 09/09/2020	DS950	DS9520070511	Complied
5.6	Power Frequency H- Field Immunity	IEC 61000-4-8	Longmont	09/10/2020 - 09/10/2020	DS950	DS9520070511	Complied
5.7	Voltage Dips and Inter- ruptions	EAC 2005 VVSG	Longmont	09/11/2020 - 09/14/2020	DS950	DS9520070511	Complied

*The decision rule used to state compliance is in accordance with the test specification used for testing. Unless otherwise noted, testing was performed in accordance with the latest published version of test specification at time of test.

5.1 Electrostatic Discharge

Electrostatic Discharge per IEC / EN 61000-4-2

Manufacturer:	Pro V&V (ES&S)	Project Number:	PR120980/B80803
Customer Representative:	Michael Walker	Test Area:	GP #1
Model:	DS950	S/N:	DS9520070511
Standard Referenced:	EAC 2005 VVSG	Date:	September 16, 2020
Temperature:	24°C	Humidity:	31%
Input Voltage:	120Vac/60Hz	Pressure:	846 mb
Configuration of Unit:	Normal Operating Mode		
Test Engineer:	Mike Tidquist		

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Test Location	Voltage Level (kV)	Polarity		Number of Pulses	Pulses Per Second	Comments	Criteria Met	Pass / Fail
		+	-					
Indirect Discharge Points								
VCP	8	x	x	10	1	4 positions Front Side	A	Pass
VCP	8	x	x	10	1	2 positions Left Side	A	Pass
VCP	8	x	x	10	1	2 positions Right Side	A	Pass
VCP	8	x	x	10	1	4 positions Back Side	A	Pass
HCP	---	x	x	---	---	Edge of HCP at Front of UUT Floor Standing Equipment N/A	---	---
Contact Discharge Points - RED Arrows.								
Figure A2	8	x	x	10	1		A	Pass
Figure A3	8	x	x	10	1		A	Pass
Figure A4	8	x	x	10	1		A	Pass
Figure A5	8	x	x	10	1		A	Pass
Figure A6	8	x	x	10	1		A	Pass
Figure A7	8	x	x	10	1		A	Pass
Air Discharge Points - BLUE Arrows.								
Figure A2	2, 4, 8, 15	x	x	10	1	At +/- 15kV to monitor Discharges occurred no disruption in operation	A	Pass
Figure A3	2, 4, 8, 15	x	x	---	---	No Air Discharges Occurred	---	---
Figure A4	2, 4, 8, 15	x	x	10	1	At +/- 15kV to monitor Discharges occurred to vent holes no disruption in operation	A	Pass
Figure A5	2, 4, 8, 15	x	x	---	---	No Air Discharges Occurred	---	---
Figure A6	2, 4, 8, 15	x	x	---	---	No Air Discharges Occurred	---	---
Figure A7	2, 4, 8, 15	x	x	10	1	At +/- 15kV to monitor Discharges occurred to vent holes no disruption in operation	A	Pass

Electrostatic Discharge per IEC / EN 61000-4-2

Manufacturer: Pro V&V (ES&S)
Customer Representative: Michael Walker
Model: DS950
Standard Referenced: EAC 2005 VVSG

Project Number: PR120980/B80803
Test Area: GP #1
S/N: DS9520070511
Date: September 16, 2020

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Figure A1. Electrostatic Discharge Test Setup.

Electrostatic Discharge per IEC / EN 61000-4-2

Manufacturer: Pro V&V (ES&S)
Customer Representative: Michael Walker
Model: DS950
Standard Referenced: EAC 2005 VVSG

Project Number: PR120980/B80803
Test Area: GP #1
S/N: DS9520070511
Date: September 16, 2020

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Figure A2. Electrostatic Discharge Test Setup.

Electrostatic Discharge per IEC / EN 61000-4-2

Manufacturer: Pro V&V (ES&S)
Customer Representative: Michael Walker
Model: DS950
Standard Referenced: EAC 2005 VVSG

Project Number: PR120980/B80803
Test Area: GP #1
S/N: DS9520070511
Date: September 16, 2020

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Figure A3. Electrostatic Discharge Test Setup.

Electrostatic Discharge per IEC / EN 61000-4-2

Manufacturer: Pro V&V (ES&S)
Customer Representative: Michael Walker
Model: DS950
Standard Referenced: EAC 2005 VVSG

Project Number: PR120980/B80803
Test Area: GP #1
S/N: DS9520070511
Date: September 16, 2020

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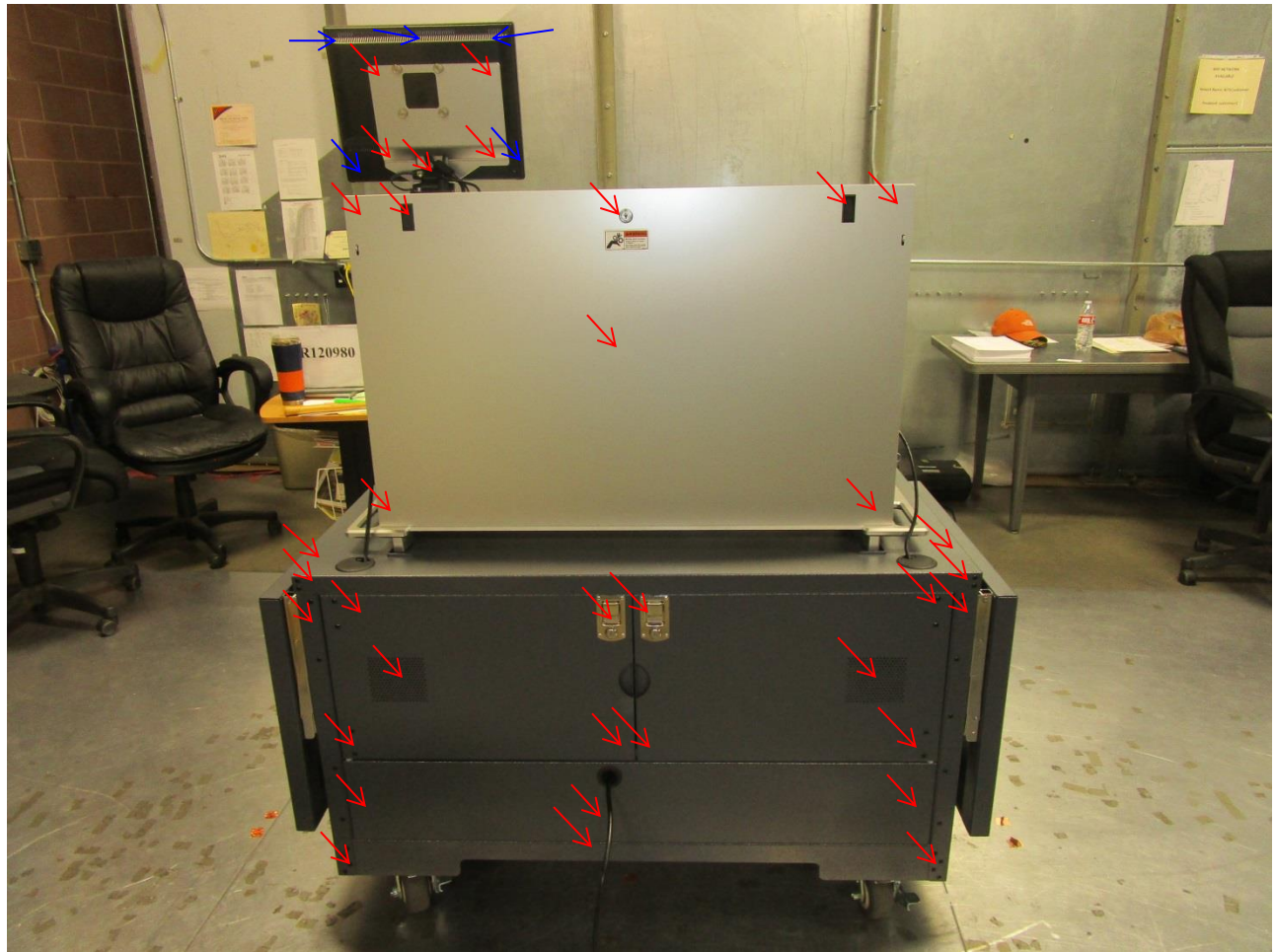


Figure A4. Electrostatic Discharge Test Setup.

Electrostatic Discharge per IEC / EN 61000-4-2

Manufacturer: Pro V&V (ES&S)
Customer Representative: Michael Walker
Model: DS950
Standard Referenced: EAC 2005 VVSG

Project Number: PR120980/B80803
Test Area: GP #1
S/N: DS9520070511
Date: September 16, 2020

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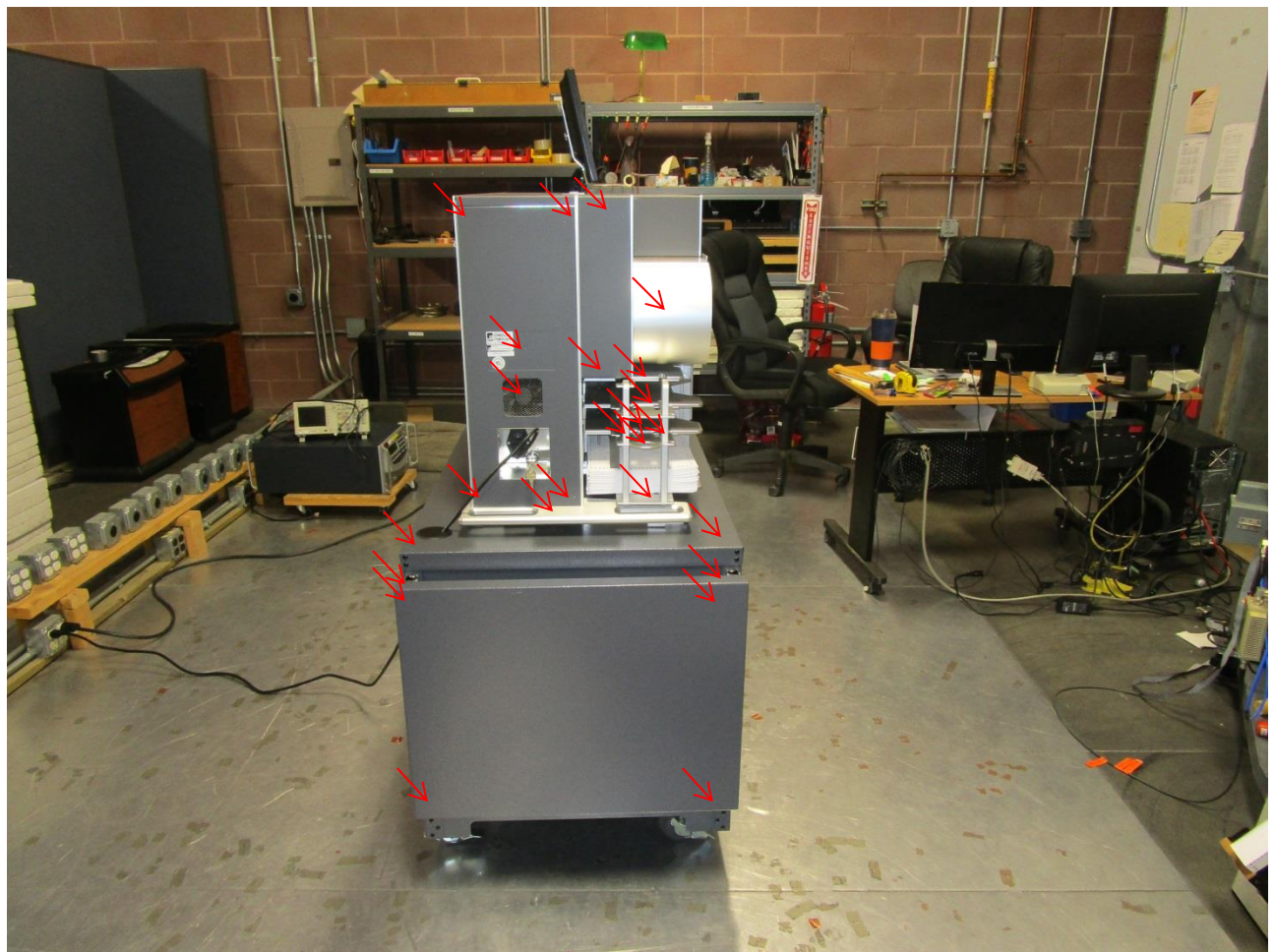


Figure A5. Electrostatic Discharge Test Setup.

Electrostatic Discharge per IEC / EN 61000-4-2

Manufacturer: Pro V&V (ES&S)
Customer Representative: Michael Walker
Model: DS950
Standard Referenced: EAC 2005 VVSG

Project Number: PR120980/B80803
Test Area: GP #1
S/N: DS9520070511
Date: September 16, 2020

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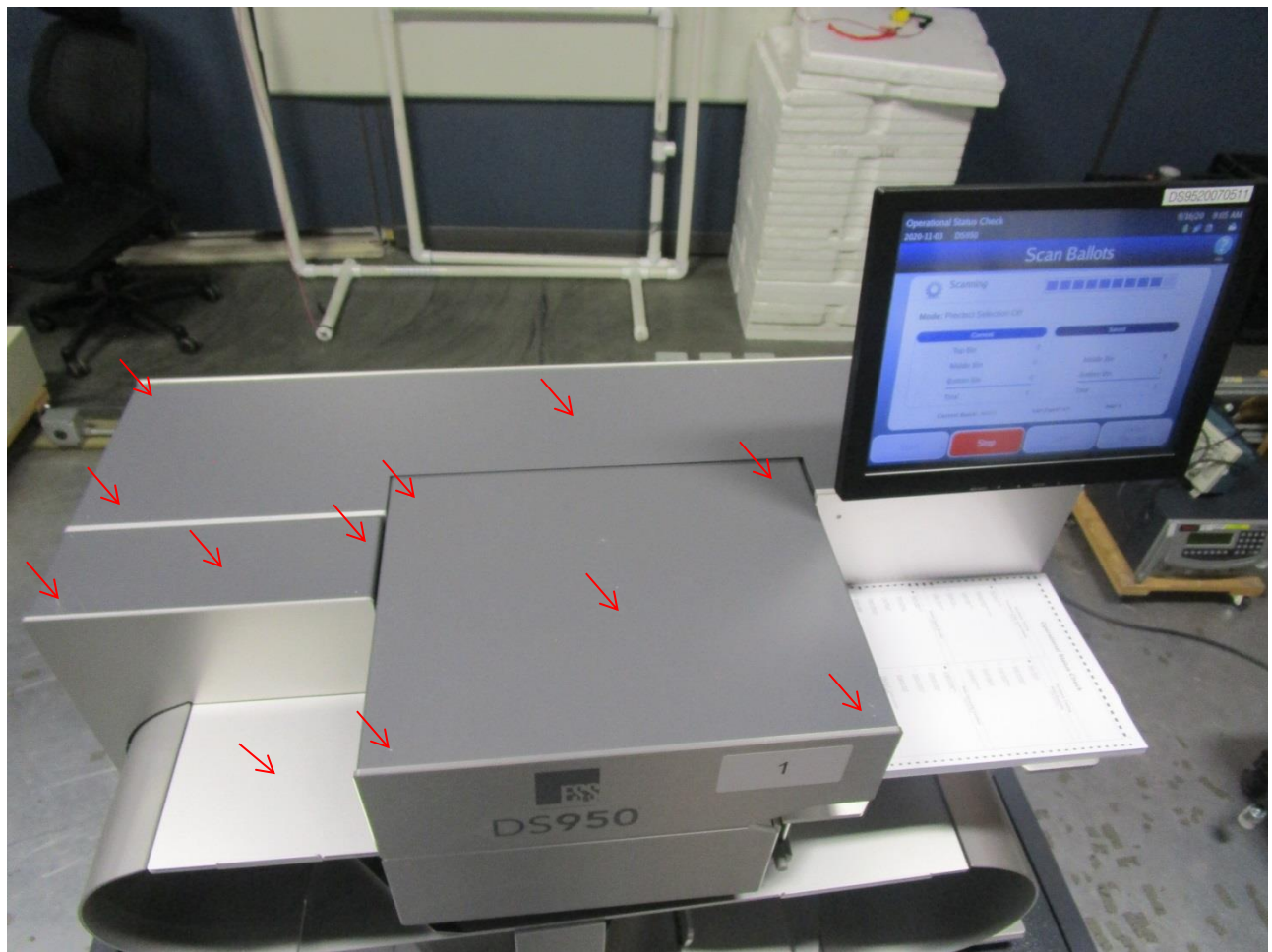


Figure A6. Electrostatic Discharge Test Setup.

Electrostatic Discharge per IEC / EN 61000-4-2

Manufacturer: Pro V&V (ES&S)
Customer Representative: Michael Walker
Model: DS950
Standard Referenced: EAC 2005 VVSG

Project Number: PR120980/B80803
Test Area: GP #1
S/N: DS9520070511
Date: September 16, 2020

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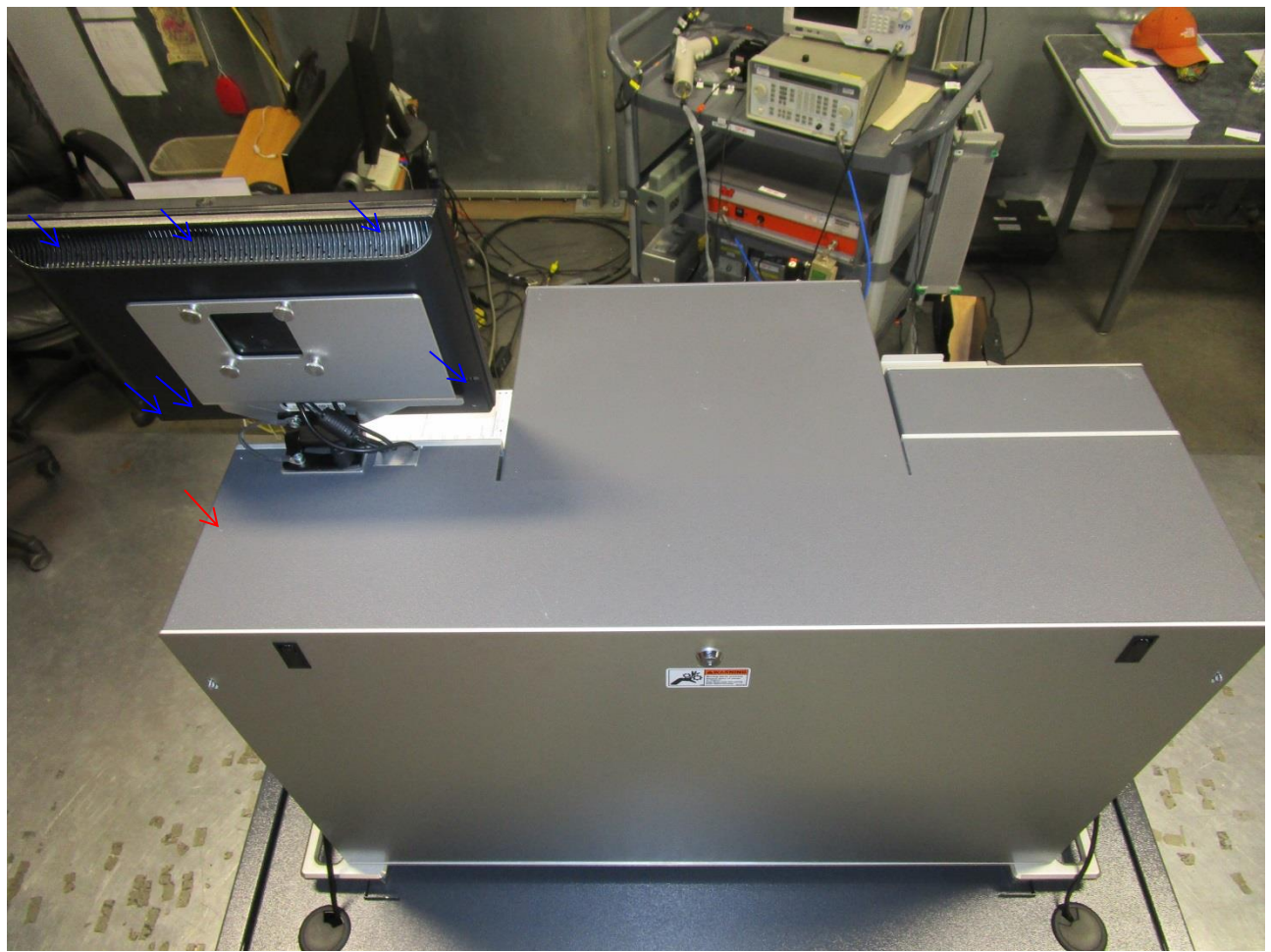


Figure A7. Electrostatic Discharge Test Setup.



Electrostatic Discharge per IEC / EN 61000-4-2

Manufacturer: Pro V&V (ES&S)
Customer Representative: Michael Walker
Model: DS950
Standard Referenced: EAC 2005 VVSG

Project Number: PR120980/B80803
Test Area: GP #1
S/N: DS9520070511
Date: September 16, 2020

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Test Equipment List

ID Number	Manufacturer	Model #	Serial #	Description	Cal Date	Cal Due
1041	Fluke	83-3	70130434	Multimeter/Frequency Meter	06/29/2020	06/29/2021
1281	EMC Partner	ESD3000	284	ESD Test System	12/19/2019	12/19/2020
1901	EXTECH	445703	0617	Hygrometer-Thermometer (WC059899)	06/29/2020	06/29/2021

5.2 Radiated RF Immunity

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

Manufacturer:	ES&S/ProV&V	Project Number:	PR120980/B80803
Customer Representative:	Michael Walker	Test Area:	GP0
Model:	DS950	S/N:	DS9520070511
Standard Referenced:	IEC 61000-4-3	Date:	September 9, 2020
Temperature:	21.9°C	Humidity:	31%
Input Voltage:	120Vac/60Hz	Pressure:	846 mb
Configuration of Unit:	Tabulating ballots		
Test Engineer:	Casey Lockhart		

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Frequency (MHz)	Modulation			Step Size (%)	Field (V/m)	Polarity (V or H)	Dwell (sec)	Comments	Criteria Met	Pass / Fail	
	Type	%	Freq								
80 - 1000	AM	80	1kHz	Sine	1	10	V	3	Front	A	Pass
80 - 1000	AM	80	1kHz	Sine	1	10	H	3		A	Pass
80 - 1000	AM	80	1kHz	Sine	1	10	V	3	Right	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

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

Manufacturer: ES&S
Customer Representative: Michael Walker
Model: DS950
Standard Referenced: IEC 61000-4-3

Project Number: PR120980/B80803
Test Area: GP0
S/N: DS9520070511
Date: September 9, 2020

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

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

Manufacturer: ES&S
Customer Representative: Michael Walker
Model: DS950
Standard Referenced: IEC 61000-4-3

Project Number: PR120980/B80803
Test Area: GP0
S/N: DS9520070511
Date: September 9, 2020

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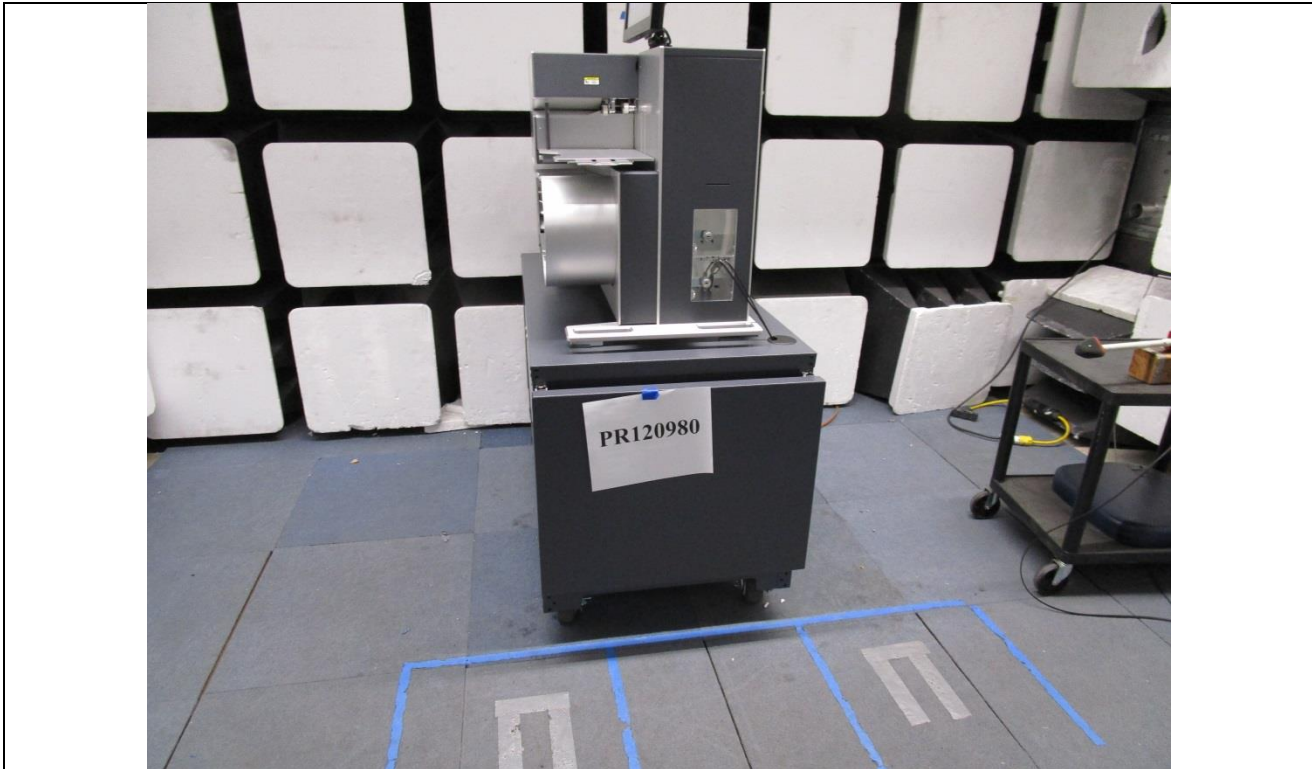


Figure B2. Radiated RF Immunity Test Setup – Right Side.

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

Manufacturer: ES&S
Customer Representative: Michael Walker
Model: DS950
Standard Referenced: IEC 61000-4-3

Project Number: PR120980/B80803
Test Area: GP0
S/N: DS9520070511
Date: September 9, 2020

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

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

Manufacturer: ES&S
Customer Representative: Michael Walker
Model: DS950
Standard Referenced: IEC 61000-4-3

Project Number: PR120980/B80803
Test Area: GP0
S/N: DS9520070511
Date: September 9, 2020

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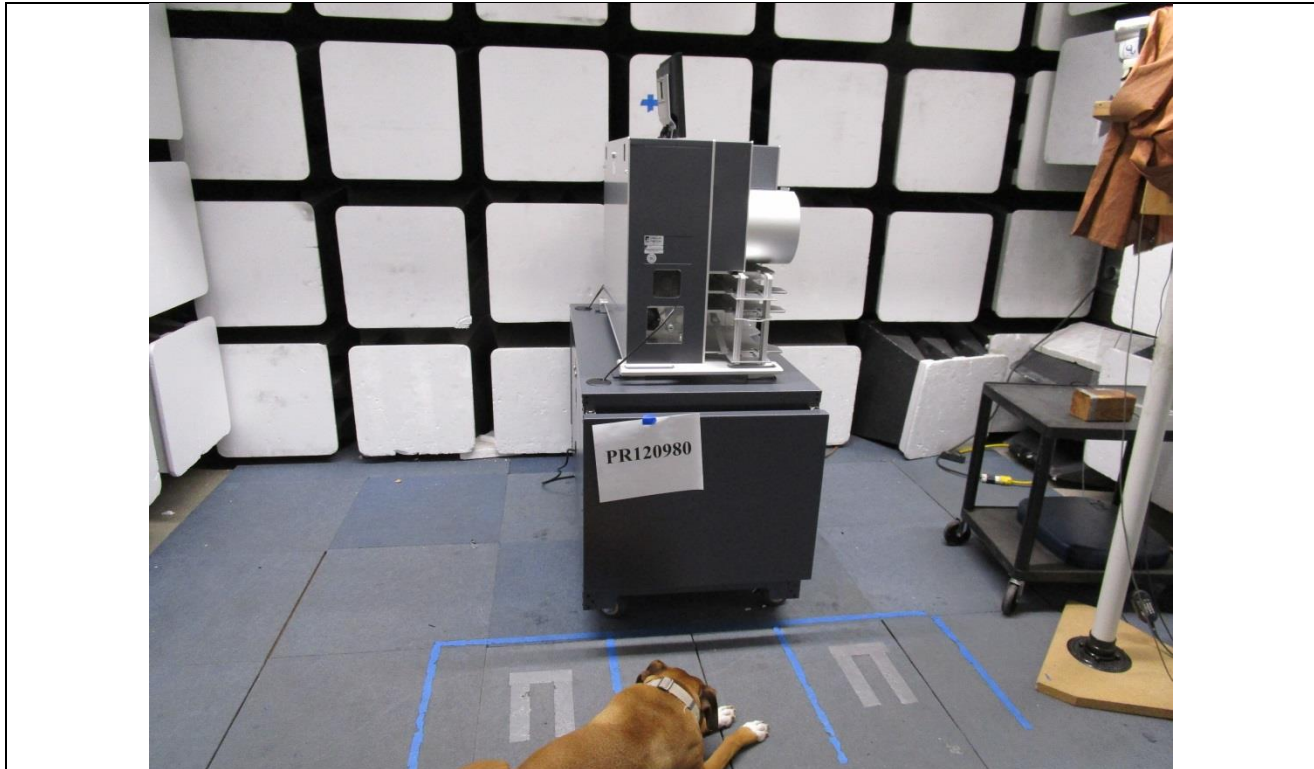


Figure B4. Radiated RF Immunity Test Setup – Left Side.



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

Manufacturer: ES&S
Customer Representative: Michael Walker
Model: DS950
Standard Referenced: IEC 61000-4-3

Project Number: B80803
Test Area: GP0
S/N: DS9520070511
Date: September 9, 2020

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Test Equipment List

ID Number	Manufacturer	Model #	Serial #	Description	Cal Date	Cal Due
1181	EMCI	RFS	V2.5.8	Initial Release 02 July 2004	NA	NA
1323	Rohde&Schwarz	SMT03	100204	Signal Generator, 5 kHz to 3 GHz	05/05/2020	05/05/2021
1453	Giga-tronics	GT-8888A	8888A0336	10 MHz to 8 GHz, +20 dBm, 25 Vdc Power Meter (WC07)	07/20/2020	07/20/2021
1456	Werlatone	C3908-10	98095	1500 Watts, 50 dB Dual Directional Coupler (WC0597)	06/29/2020	06/29/2021
1476	ETS Lindgren	HI-6053	00144805	10 MHz to 40 GHz Isotropic Electric Field Probe	04/27/2020	04/27/2021
1478	Ophir	5127F	1100	RF Amplifier, 200 Watt, 20 - 1000 MHz	NA	NA
1722	ETS -Lindgren	3142B	1624	Antenna	NA	NA
1761	Braden Shielding Systems	RF Shield Room	N/A	GP0	05/15/2020	05/15/2021



5.3 Electrical Fast Transient / Burst

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

Manufacturer: <u>ES&S/ProV&V</u>	Project Number: <u>PR120980/B80803</u>
Customer Representative: <u>Michael Walker</u>	Test Area: <u>GPI</u>
Model: <u>DS950</u>	S/N: <u>DS9520070511</u>
Standard Referenced: <u>IEC – 61000-4-4</u>	Date: <u>September 10, 2020</u>
Temperature: <u>24°C</u> Humidity: <u>38%</u>	Pressure: <u>846mb</u>
Input Voltage: <u>120Vac/60Hz</u>	
Configuration of Unit: <u>Normal Operating Mode</u>	
Test Engineer: <u>Casey Lockhart</u>	

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Voltage (kV)	Polarity		Time (sec)	Injection Type	L 1	L 2	L 3	N	P E	Rep Freq.	Comments	Criteria Met	Pass / Fail
	+	-											
2.0	x		60	CDN	x					100k Hz	AC	A	Pass
2.0		x	60	CDN	x					100k Hz		A	Pass
2.0	x		60	CDN		x				100k Hz		A	Pass
2.0		x	60	CDN		x				100k Hz		A	Pass
2.0	x		60	CDN					x	100k Hz		A	Pass
2.0		x	60	CDN					x	100k Hz		A	Pass
2.0	x		60	CDN	x	x			x	100k Hz		A	Pass
2.0		x	60	CDN	x	x			x	100k Hz		A	Pass

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

Manufacturer: ES&S/ProV&V
Customer Representative: Michael Walker
Model: DS950
Standard Referenced: IEC – 61000-4-4

Project Number: PR120980/B80803
Test Area: GP1
S/N: DS9520070511
Date: September 10, 2020

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Figure C1. Electrical Fast Transient Test Setup.

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

Manufacturer: ES&S/ProV&V
Customer Representative: Michael Walker
Model: DS950
Standard Referenced: IEC – 61000-4-4

Project Number: PR120980/B80803
Test Area: GP1
S/N: DS9520070511
Date: September 10, 2020

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



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

Manufacturer: ES&S/ProV&V
Customer Representative: Michael Walker
Model: DS950
Standard Referenced: IEC – 61000-4-4

Project Number: PR120980/B80803
Test Area: GP1
S/N: DS9520070511
Date: September 10, 2020

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Test Equipment List

ID Number	Manufacturer	Model #	Serial #	Description	Cal Date	Cal Due
1184	KeyTek	CEWare	4.0	KeyTek EMCPro Control Software for EFT, Surge, H-F	NA	NA
1372	Tektronix	TDS2002B	C103489	Oscilloscope, 60 MHz, 2-channel (WC059683)	06/29/2020	06/29/2021
1566	Thermo Fisher Scientific	EMC Pro Plus	1502199	Advanced EMC Immunity Tester	10/07/2019	10/07/2020
1901	EXTECH	445703	0617	Hygrometer-Thermometer (WC059899)	06/29/2020	06/29/2021



5.4 Surge Immunity

Surge Immunity per IEC / EN 61000-4-5

Manufacturer:	Pro V&V (ES&S)	Project Number:	PR120980/B80803
Customer Representative:	Michael Walker	Test Area:	GP #1
Model:	DS950	S/N:	DS9520070511
Standard Referenced:	EAC 2005 VVSG	Date:	September 15, 2020
Temperature:	24°C	Humidity:	38%
Input Voltage:	120Vac/60Hz	Pressure:	843 mb
Configuration of Unit:	Normal Operating Mode		
Test Engineer:	Mike Tidquist		

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Voltage (kV)	Polarity		L 1	L 2	L 3	N	P E	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	x	0	5	30	Common Mode Line	A	Pass
0.5		x	x			x	x	0	5	30		A	Pass
0.5	x		x			x	x	90	5	30		A	Pass
0.5		x	x			x	x	90	5	30		A	Pass
0.5	x		x			x	x	180	5	30		A	Pass
0.5		x	x			x	x	180	5	30		A	Pass
0.5	x		x			x	x	270	5	30		A	Pass
0.5		x	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



Surge Immunity per IEC / EN 61000-4-5

Manufacturer:	Pro V&V (ES&S)	Project Number:	PR120980/B80803
Customer Representative:	Michael Walker	Test Area:	GP #1
Model:	DS950	S/N:	DS9520070511
Standard Referenced:	EAC 2005 VVSG	Date:	September 15, 2020
Temperature:	24°C	Humidity:	38%
Input Voltage:	120Vac/60Hz	Pressure:	843 mb
Configuration of Unit:	Normal Operating Mode		
Test Engineer:	Mike Tidquist		

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Voltage (kV)	Polarity		L 1	L 2	L 3	N	P E	Phase (deg)	Number of Pulses	Delay (sec)	Comments	Criteria Met	Pass / Fail
	+	-											
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	60	Common Mode Line	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	60	Common Mode Neutral	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
2.0	x		x			x		0	5	60	Common Mode Line	A	Pass
2.0		x	x			x		0	5	60		A	Pass



Surge Immunity per IEC / EN 61000-4-5

Manufacturer:	Pro V&V (ES&S)	Project Number:	PR120980/B80803
Customer Representative:	Michael Walker	Test Area:	GP #1
Model:	DS950	S/N:	DS9520070511
Standard Referenced:	EAC 2005 VVSG	Date:	September 15, 2020
Temperature:	24°C	Humidity:	38%
Input Voltage:	120Vac/60Hz	Pressure:	843 mb
Configuration of Unit:	Normal Operating Mode		
Test Engineer:	Mike Tidquist		

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Voltage (kV)	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	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
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

Surge Immunity per IEC / EN 61000-4-5

Manufacturer: Pro V&V (ES&S)
Customer Representative: Michael Walker
Model: DS950
Standard Referenced: EAC 2005 VVSG

Project Number: PR120980B80803
Test Area: GP #1
S/N: DS9520070511
Date: September 15, 2020

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Figure D1. Surge Immunity Test Setup.

Surge Immunity per IEC / EN 61000-4-5

Manufacturer: Pro V&V (ES&S)
Customer Representative: Michael Walker
Model: DS950
Standard Referenced: EAC 2005 VVSG

Project Number: PR120980B80803
Test Area: GP #1
S/N: DS9520070511
Date: September 15, 2020

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Figure D2. Surge Immunity Test Setup – AC Mains.



Surge Immunity per IEC / EN 61000-4-5

Manufacturer:	Pro V&V (ES&S)	Project Number:	PR120980B80803
Customer Representative:	Michael Walker	Test Area:	GP #1
Model:	DS950	S/N:	DS9520070511
Standard Referenced:	EAC 2005 VVSG	Date:	September 15, 2020

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Test Equipment List

ID Number	Manufacturer	Model #	Serial #	Description	Cal Date	Cal Due
1041	Fluke	83-3	70130434	Multimeter/Frequency Meter	06/29/2020	06/29/2021
1184	KeyTek	CEWare	4.0	KeyTek EMCPro Control Software for EFT, Surge, H-F	NA	NA
1372	Tektronix	TDS2002B	C103489	Oscilloscope, 60 MHz, 2-channel (WC059683)	06/29/2020	06/29/2021
1566	Thermo Fisher Scientific	EMC Pro Plus	1502199	Advanced EMC Immunity Tester	10/07/2019	10/07/2020
1901	EXTECH	445703	0617	Hygrometer-Thermometer (WC059899)	06/29/2020	06/29/2021



5.5 Conducted RF Immunity

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

Manufacturer:	ES&S/ProV&V	Project Number:	PR120980/B80803
Customer Representative:	Michael Walker	Test Area:	GP1
Model:	DS950	S/N:	DS9520070511
Standard Referenced:	IEC 61000-4-6	Date:	September 10, 2020
Temperature:	21.3°C	Humidity:	32%
Input Voltage:	120Vac/60Hz	Pressure:	846 mb
Configuration of Unit:	Tabulating ballots		
Test Engineer:	Casey Lockhart		

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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

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

Manufacturer: Pro V&V
Customer Representative: Michael Walker
Model: DS950
Standard Referenced: FCC Class B

Project Number: B80803
Test Area: GP1
S/N: DS9520070511
Date: September 10, 2020

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Figure E1. Conducted RF Immunity Test Setup.

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

Manufacturer: Pro V&V
Customer Representative: Michael Walker
Model: DS950
Standard Referenced: FCC Class B

Project Number: B80803
Test Area: GP1
S/N: DS9520070511
Date: September 10, 2020

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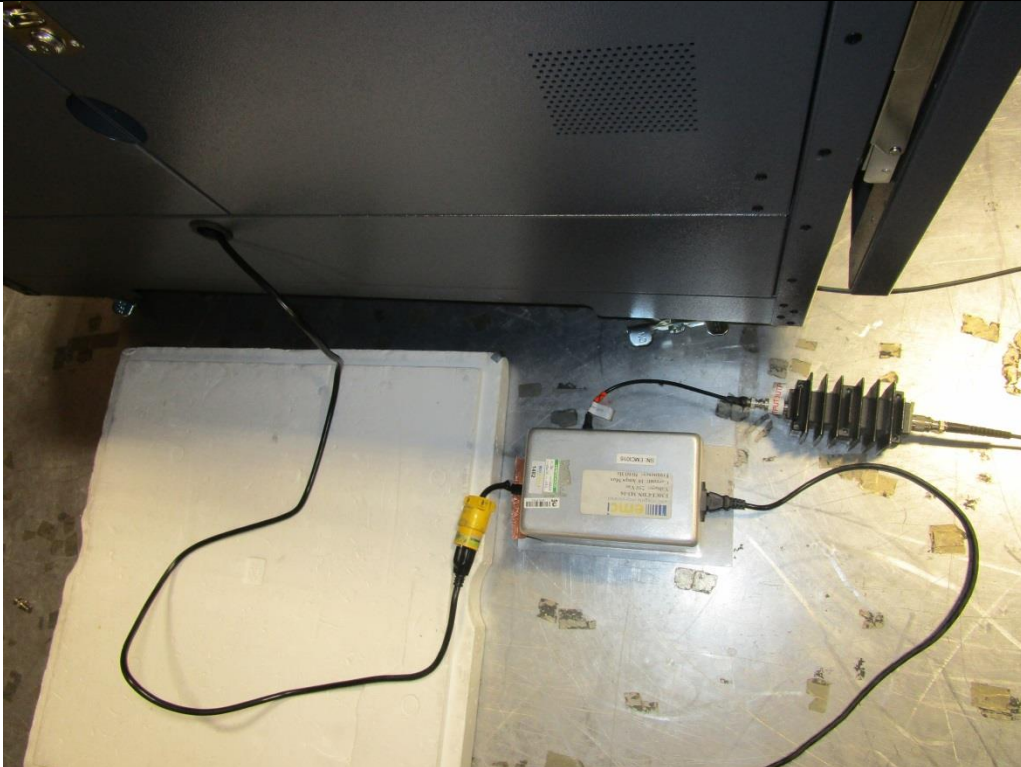


Figure E2. Conducted RF Immunity Test Setup – AC Mains.



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

Manufacturer: Pro V&V
Customer Representative: Michael Walker
Model: DS950
Standard Referenced: FCC Class B

Project Number: B80803
Test Area: GP1
S/N: DS9520070511
Date: September 10, 2020

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Test Equipment List

ID Number	Manufacturer	Model #	Serial #	Description	Cal Date	Cal Due
1023	Amplifier Research	75A250	28844	75 Watt Amplifier (10 kHz - 250 MHz)	NA	NA
1477	Hewlett Packard	8648A	3636A02899	Signal Generator, 100 kHz to 1 GHz	05/27/2020	05/27/2021
1482	EMCI	EMCI-CDN-M3-16	EMCI016	M3 CDN, 16A, 250 VAC	11/06/2019	11/06/2020
1532	Werlatone	C9475-13	102545	100 Watt Dual Directional Coupler, 10 kHz to 250 M	10/24/2019	10/24/2020
1575	Rigol Technologies, Inc	DSA815-TG	DSA8A162150400	9 kHz to 1.5 GHz Spectrum Analyzer w/ tracking gen	12/13/2019	12/13/2020
1594	EMCI	CI	V2.5.0	Conducted Immunity Software	NA	NA
1901	EXTECH	445703	0617	Hygrometer-Thermometer (WC059899)	06/29/2020	06/29/2021

5.6 Power Frequency H-Field Immunity

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

Manufacturer:	ES&S/Pr0V&V	Project Number:	PR120980/B80803
Customer Representative:	Michael Walker	Test Area:	GP1
Model:	DS950	S/N:	DS9520070511
Standard Referenced:	IEC 61000 -4-8	Date:	September 10, 2020
Temperature:	24°C	Humidity:	38%
Input Voltage:	120Vac/60Hz	Pressure:	846 mb
Configuration of Unit:	Normal Operating Mode		
Test Engineer:	Casey Lockhart		

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

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

Manufacturer: ES&S/Pr0V&V
Customer Representative: Michael Walker
Model: DS950
Standard Referenced: IEC 61000 -4-8

Project Number: PR120980/B80803
Test Area: GP1
S/N: DS9520070511
Date: September 10, 2020

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

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

Manufacturer: ES&S/Pr0V&V
Customer Representative: Michael Walker
Model: DS950
Standard Referenced: IEC 61000 -4-8

Project Number: PR120980/B80803
Test Area: GP1
S/N: DS9520070511
Date: September 10, 2020

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Figure F2. Power Frequency H-field Immunity Test Setup.



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

Manufacturer:	ES&S/Pr0V&V	Project Number:	PR120980B80803
Customer Representative:	Michael Walker	Test Area:	GP1
Model:	DS950	S/N:	DS9520070511
Standard Referenced:	IEC 61000 -4-8	Date:	September 10, 2020

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Test Equipment List

ID Number	Manufacturer	Model #	Serial #	Description	Cal Date	Cal Due
1372	Tektronix	TDS2002B	C103489	Oscilloscope, 60 MHz, 2-channel (WC059683)	06/29/2020	06/29/2021
1548	California Instruments/A metek	1251P	1423A06347	AC Power supply	NA	NA
1718	NTS	1mx1m loop	001	H Loop antenna	NA	NA



5.7 Voltage Dips and Interruptions

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

Manufacturer:	Pro V&V Inc. ES&S	Project Number:	PR120980
Customer Representative:	Michael Walker	Test Area:	GP #1
Model:	DS950 ExpressVote 2.1 (Configuration 1)	S/N:	EV0219400585
Standard Referenced:	EAC 2005 VVSG	Date:	September 11, 2020
Temperature:	20°C	Humidity:	34%
Input Voltage:	120Vac/60Hz	Pressure:	846 mb
Configuration of Unit:	Counting Ballots		
Test Engineer:	T. Wittig/Mike Tidquist		

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% Nominal	No. of Cycles	Phase Angle (deg)				Time between dropouts (sec)	Number of tests	Comments	Criteria Met	Pass / Fail
		0	90	180	270					
70%	0.6	x				10	3		A	Pass
70%	0.6		x			10	3		A	Pass
70%	0.6			x		10	3		A	Pass
70%	0.5				x	10	3		A	Pass
40%	6.0	x				10	3		A	Pass
40%	6.0		x			10	3		A	Pass
40%	6.0			x		10	3		A	Pass
40%	6.0				x	10	3		A	Pass
40%	60.0	x				10	3		A	Pass
40%	60.0		x			10	3		A	Pass
40%	60.0			x		10	3		A	Pass
40%	60.0				x	10	3		A	Pass
0%	300	x				10	3		A	Pass
0%	300			x		10	3		A	Pass
Line Voltage Variation tests										
129Vac Line Voltage Variations (+7.5% of nominal 120V) 2hrs.									A	Pass
105Vac Line Voltage Variations (-12.5% of nominal 120V) 2 Hrs.									A	Pass
Surges of +15% line variations of nominal voltage (138V) 2 Hrs.									A	Pass
Surges of -15% line variations of nominal voltage (102V) 2 Hrs.									A	Pass

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

Manufacturer: Pro V&V Inc. ES&S
Customer Representative: Michael Walker
Model: DS950 ExpressVote 2.1 (Configuration 1)
Standard Referenced: EAC 2005 VVSG

Project Number: PR120980
Test Area: GP #1
S/N: EV0219400585
Date: September 11, 2020

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Figure G1. Voltage Dips and Interrupts Test Setup.



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

Manufacturer: Pro V&V Inc. ES&S
Customer Representative: Michael Walker
Model: DS950 ExpressVote 2.1 (Configuration 1)
Standard Referenced: EAC 2005 VVSG

Project Number: PR120980
Test Area: GP #1
S/N: EV0219400585
Date: September 11, 2020

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Test Equipment List

ID Number	Manufacturer	Model #	Serial #	Description	Cal Date	Cal Due
1013	KeyTek	EMC Pro	0008347	Advanced EMC Immunity Tester	09/22/2019	09/22/2020
1520	California Instruments (AMETEK)	5001IX-CTS	1341A03198	5kVA AC Power Source	NA	NA
1041	Fluke	83-3	70130434	Multimeter/Frequency Meter	06/29/2020	06/29/2021
1184	KeyTek	CEWare	4.0	KeyTek EMCPro Control Software for EFT, Surge, H-F	NA	NA
1371	Tektronix	TDS2002B	C103483	Oscilloscope, 60 MHz, 2-channel	02/24/2020	02/24/2021
1901	EXTECH	445703	0617	Hygrometer-Thermometer (WC059899)	06/29/2020	06/29/2021

6.0 Test Log

EMI Test Log

Manufacturer: <u>Pro V&V (ES&S)</u>	Project Number: <u>PR120980/B80803</u>
Model: <u>DS950</u>	S/N: <u>DS9520070511</u>
Customer Representative: <u>Michael Walker</u>	
Standard Referenced: _____	

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Ground Planes / CALC

Test	Test Code	Date	Event	O T	Time (hrs)	Result	Initials
4-3	---	1200 - 1630	Radiated RF Immunity 10V/m, 80 - 1000 MHz, 1% Step, 80% AM, 1kHz sine, 3s dwell, 120/60 VAC Note: Client had UPS issues, changed, I had equipment issues (Forward Power Meter/USB port)		4.0	Pass	CL
---	---	0800 - 0900	Continue Radiated RF Immunity 10V/m, 80 - 1000 MHz, 1% Step, 80% AM, 1kHz sine, 3s dwell, 120/60 VAC		1.0	Pass	CL
4-6	---	0900 - 1000	Conducted RF Immunity 10Vrms, 0.15 - 80 MHz, 1% Step, 80% AM, 1kHz sine, 3s dwell, 120/60 VAC		1.0	Pass	CL
4-4	---	1000 - 1100	Electrical Fast Transient / Burst Mains: +/- 2kV, I/O: +/- 1kV, 120/60 VAC		1.0	Pass	CL
4-8	---	1100 - 1200	Power Frequency H-Field Immunity 30A/m, 50 / 60 Hz, 3 axes, 120/60 VAC		1.0	Pass	CL
4-11		September 11, 2020 0800-1200	Voltage Dips and Interruptions (Inc./Red. of Nom. Voltage) Electric power increases of 7.5% and reductions of 12.5% of nominal specified power. 120/60 VAC		4.0	Pass	TW
4-11		1200-1400	Voltage Dips and Interruptions (Surge of +/- 15%) Surge of +/- 15% line variation of nominal line voltage 120/60 VAC Performed testing at Surges of +15% line variations of nominal voltage (138V) 2 Hrs.		2.0	Pass	TW
		1430	Client stopped for the day				
			**** Need to complete, Surges of -15% line variations of nominal voltage (102V) 2 Hrs. AND Voltage Dips and Interruptions 70% nom, 0.6 cycles / 40% nom, 6 cycles & 1 sec. / 0% nom, 300 cycles 120/60 VAC				

EMI Test Log

Manufacturer: <u>Pro V&V (ES&S)</u>	Project Number: <u>PR120980/B80803</u>
Model: <u>DS950</u>	S/N: <u>DS9520070511</u>
Customer Representative: <u>Michael Walker</u>	
Standard Referenced: _____	

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Ground Planes / CALC

Test	Test Code	Date	Event	O T	Time (hrs)	Result	Initials
4-11		September 14, 2020 0800-1000	Voltage Dips and Interruptions (Surge of +/- 15%) Surge of +/- 15% line variation of nominal line voltage 120/60 VAC Performed testing at Surges of +15% line variations of nominal voltage (102V) 2 Hrs.		2.0	Pass	MT
4-11		1000-1130	Voltage Dips and Interruptions 70% nom, 0.6 cycles / 40% nom, 6 cycles & 1 sec. / 0% nom, 300 cycles 120/60 VAC		1.5	Pass	MT
4-5		September 15, 2020 0800-1430	Surge Immunity Mains: +/- 2kV CM, +/- 2kV DM, (0, 90, 180, 270) 120/60 VAC		6.5	Pass	MT
4-2		September 16, 2020 0800-1200	Electrostatic Discharge +/- 8kV Contact, +/-2, 4, 8, 15kV Air 120/60 VAC ESD Vertical Coupling plane was performed on 4 positions front and back and 2 positions right and left		4.0	Pass	MT



End of Report