

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

Prepared For

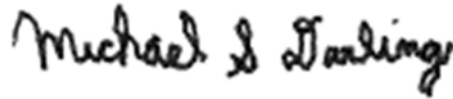
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A handwritten signature in black ink, appearing to read "Karen Norton", written over a horizontal line.

Karen Norton,
Preparer

A handwritten signature in black ink, appearing to read "Michael Darling", written over a horizontal line.

Michael Darling
EMI Department Manager



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Revision History

Rev.	Description	Issue Date
0	Initial Release	07/09/2021

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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) 2020-005,2020-007,Signed COS, dated 07/02/2020,10/21/2020,02/11/2021
- National Technical Systems (NTS) Quote(s) OP0565856, dated 10/22/2020
- 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 Specifications: IEC / EN 61000-4-2, IEC / EN 61000-4-3, IEC / EN 61000-4-4, IEC / EN 61000-4-5, IEC / EN 61000-4-6, IEC / EN 61000-4-8, and IEC / EN 61000-4-11

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	FVS	FVS	VST 100 115

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	IEC / EN 61000-4-2	Longmont	09/21/2020	FVS	VST 100 115	Complied
5.2	Radiated RF Immunity	IEC / EN 61000-4-3	Longmont	01/18/2021	FVS	VST 100 115	Complied
5.3	Electrical Fast Transient / Burst	IEC / EN 61000-4-4	Longmont	09/17/2020	FVS	VST 100 115	Complied
5.4	Surge Immunity	IEC / EN 61000-4-5	Longmont	01/12/2021	FVS	VST 100 115	Complied
5.5	Conducted RF Immunity	IEC / EN 61000-4-6	Longmont	09/16/2021	FVS	VST 100 115	Complied
5.6	Power Frequency H-Field Immunity	IEC / EN 61000-4-8	Longmont	09/17/2021	FVS	VST 100 115	Complied
5.7	Voltage Dips and Interruptions	IEC / EN 61000-4-11	Longmont	09/17/2021	FVS	VST 100 115	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:	Unisyn	Project Number:	B80802
Customer Representative:	Michael Walker	Test Area:	GP2
Model:	FVS	S/N:	FVS-001
Standard Referenced:	IEC 61000-4-2	Date:	September 21, 2020
Temperature:	22.1 °C	Humidity:	37%
Input Voltage:	120Vac/60Hz	Pressure:	841 mb
Configuration of Unit:	Normal Operating Mode		
Test Engineer:	Casey Lockhart		

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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	Front Side	A	Pass
VCP	8	x	x	10	1	Left Side	A	Pass
VCP	8	x	x	10	1	Right Side	A	Pass
VCP	8	x	x	10	1	Back Side	A	Pass
HCP	8	x	x	10	1	Edge of HCP at Front of UUT	N/A	N/A
Contact Discharge Points - RED Arrows.								
Figure A2	8	x	x	10	1	No discharge points found.	---	---
Figure A3	8	x	x	10	1	No discharge points found.	---	---
Figure A4	8	x	x	10	1	No discharge points found.	---	---
Figure A5	8	x	x	10	1	No discharge points found.	---	---
Figure A6	8	x	x	10	1	No discharge points found.	---	---
Figure A7	8	x	x	10	1	No discharge points found.	---	---
Air Discharge Points - BLUE Arrows.								
Figure A2	2, 4, 8, 15	x	x	10	1		A	Pass
Figure A3	2, 4, 8, 15	x	x	10	1		A	Pass
Figure A4	2, 4, 8, 15	x	x	10	1	No discharge points found.	---	---
Figure A5	2, 4, 8, 15	x	x	10	1	No discharge points found.	---	---
Figure A6	2, 4, 8, 15	x	x	10	1	No discharge points found.	---	---
Figure A7	2, 4, 8, 15	x	x	10	1	No discharge points found.	---	---

Electrostatic Discharge per IEC / EN 61000-4-2

Manufacturer:	<u>Unisyn</u>	Project Number:	<u>B80802</u>
Customer Representative:	<u>Michael Walker</u>	Test Area:	<u>GP2</u>
Model:	<u>FVS</u>	S/N:	<u>FVS-001</u>
Standard Referenced:	<u>IEC 61000-4-2</u>	Date:	<u>September 21, 2020</u>

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Figure A1. Electrostatic Discharge Test Setup.

Electrostatic Discharge per IEC / EN 61000-4-2

Manufacturer:	Unisyn	Project Number:	B80802
Customer Representative:	Michael Walker	Test Area:	GP2
Model:	FVS	S/N:	FVS-001
Standard Referenced:	IEC 61000-4-2	Date:	September 21, 2020

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Figure A2. Electrostatic Discharge Test Setup.

Electrostatic Discharge per IEC / EN 61000-4-2

Manufacturer:	<u>Unisyn</u>	Project Number:	<u>B80802</u>
Customer Representative:	<u>Michael Walker</u>	Test Area:	<u>GP2</u>
Model:	<u>FVS</u>	S/N:	<u>FVS-001</u>
Standard Referenced:	<u>IEC 61000-4-2</u>	Date:	<u>September 21, 2020</u>

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Figure A3. Electrostatic Discharge Test Setup.

Electrostatic Discharge per IEC / EN 61000-4-2

Manufacturer:	<u>Unisyn</u>	Project Number:	<u>B80802</u>
Customer Representative:	<u>Michael Walker</u>	Test Area:	<u>GP2</u>
Model:	<u>FVS</u>	S/N:	<u>FVS-001</u>
Standard Referenced:	<u>IEC 61000-4-2</u>	Date:	<u>September 21, 2020</u>

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Figure A4. Electrostatic Discharge Test Setup.

Electrostatic Discharge per IEC / EN 61000-4-2

Manufacturer:	<u>Unisyn</u>	Project Number:	<u>B80802</u>
Customer Representative:	<u>Michael Walker</u>	Test Area:	<u>GP2</u>
Model:	<u>FVS</u>	S/N:	<u>FVS-001</u>
Standard Referenced:	<u>IEC 61000-4-2</u>	Date:	<u>September 21, 2020</u>

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Figure A5. Electrostatic Discharge Test Setup.

Electrostatic Discharge per IEC / EN 61000-4-2

Manufacturer:	<u>Unisyn</u>	Project Number:	<u>B80802</u>
Customer Representative:	<u>Michael Walker</u>	Test Area:	<u>GP2</u>
Model:	<u>FVS</u>	S/N:	<u>FVS-001</u>
Standard Referenced:	<u>IEC 61000-4-2</u>	Date:	<u>September 21, 2020</u>

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Figure A6. Electrostatic Discharge Test Setup.

Electrostatic Discharge per IEC / EN 61000-4-2

Manufacturer:	<u>Unisyn</u>	Project Number:	<u>B80802</u>
Customer Representative:	<u>Michael Walker</u>	Test Area:	<u>GP2</u>
Model:	<u>FVS</u>	S/N:	<u>FVS-001</u>
Standard Referenced:	<u>IEC 61000-4-2</u>	Date:	<u>September 21, 2020</u>

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Figure A7. Electrostatic Discharge Test Setup.



Electrostatic Discharge per IEC / EN 61000-4-2

Manufacturer:	Unisyn	Project Number:	B80802
Customer Representative:	Michael Walker	Test Area:	GP2
Model:	FVS	S/N:	FVS-001
Standard Referenced:	IEC 61000-4-2	Date:	September 21, 2020

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Test Equipment List

ID Number	Manufacturer	Model #	Serial #	Description	Cal Date	Cal Due
1333	EMC Partner	ESD3000	395	ESD Test System, including ESD3000DN1-1540 30kV Ad	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:	Unisyn/Pr0V&V	Project Number:	PR121029/B80802
Customer Representative:	Michael Walker	Test Area:	GP #0
Model:	FVS	S/N:	VST100115
Standard Referenced:	IEC 61000-4-3	Date:	January 18, 2021
Temperature:	29°C	Humidity:	22%
Input Voltage:	120Vac/60Hz	Pressure:	836 mb
Configuration of Unit:	Normal Operating Mode		
Test Engineer:	Mike Tidquist		

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

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

Manufacturer:	Unisyn/PrOV&V	Project Number:	PR121029/B80802
Customer Representative:	Michael Walker	Test Area:	GP #0
Model:	FVS	S/N:	VST100115
Standard Referenced:	IEC 61000-4-3	Date:	January 18, 2021

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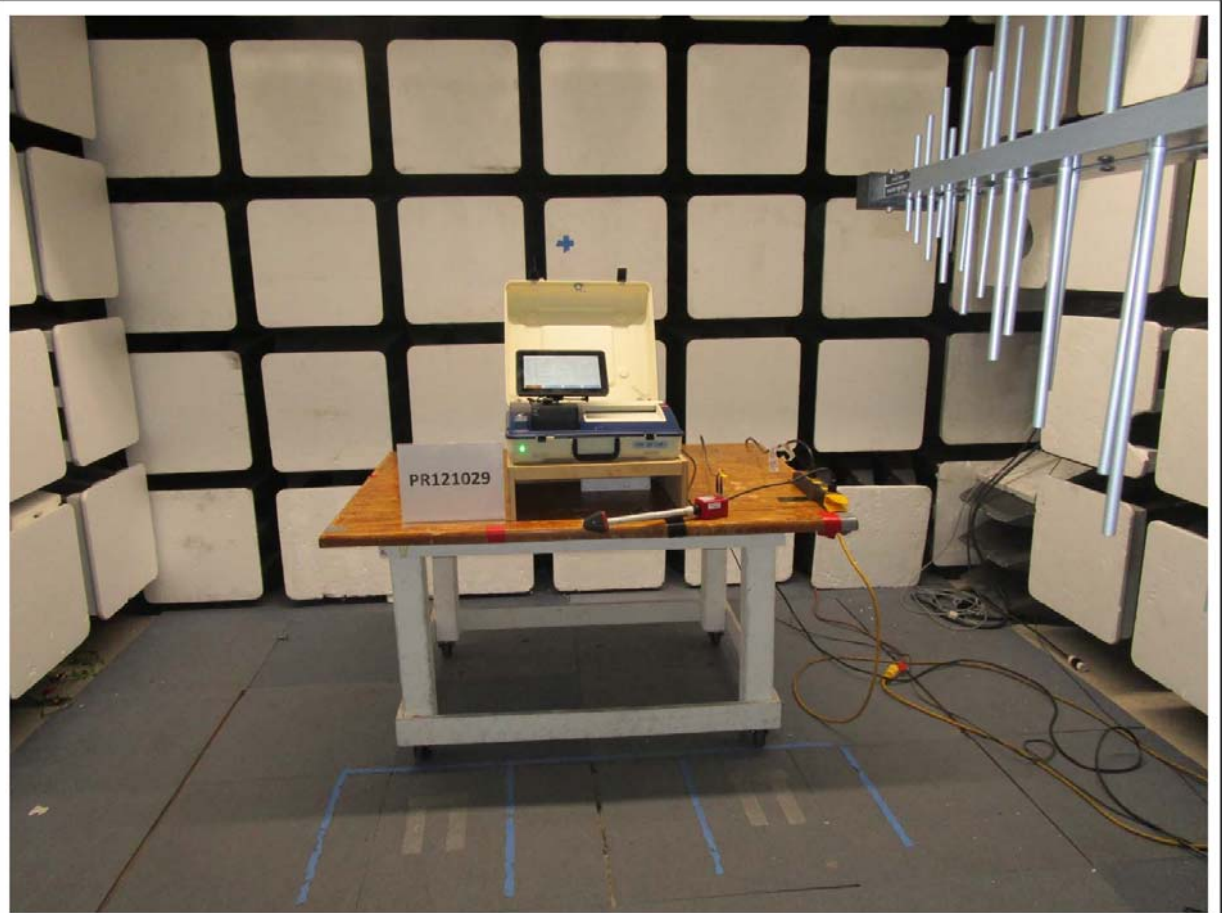


Figure B1. Radiated RF Immunity Test Setup – Front Side.

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

Manufacturer: Unisyn/ProV&V
Customer Representative: Michael Walker
Model: FVS
Standard Referenced: IEC 61000-4-3

Project Number: PR121029/B80802
Test Area: GP #0
S/N: VST100115
Date: January 18, 2021

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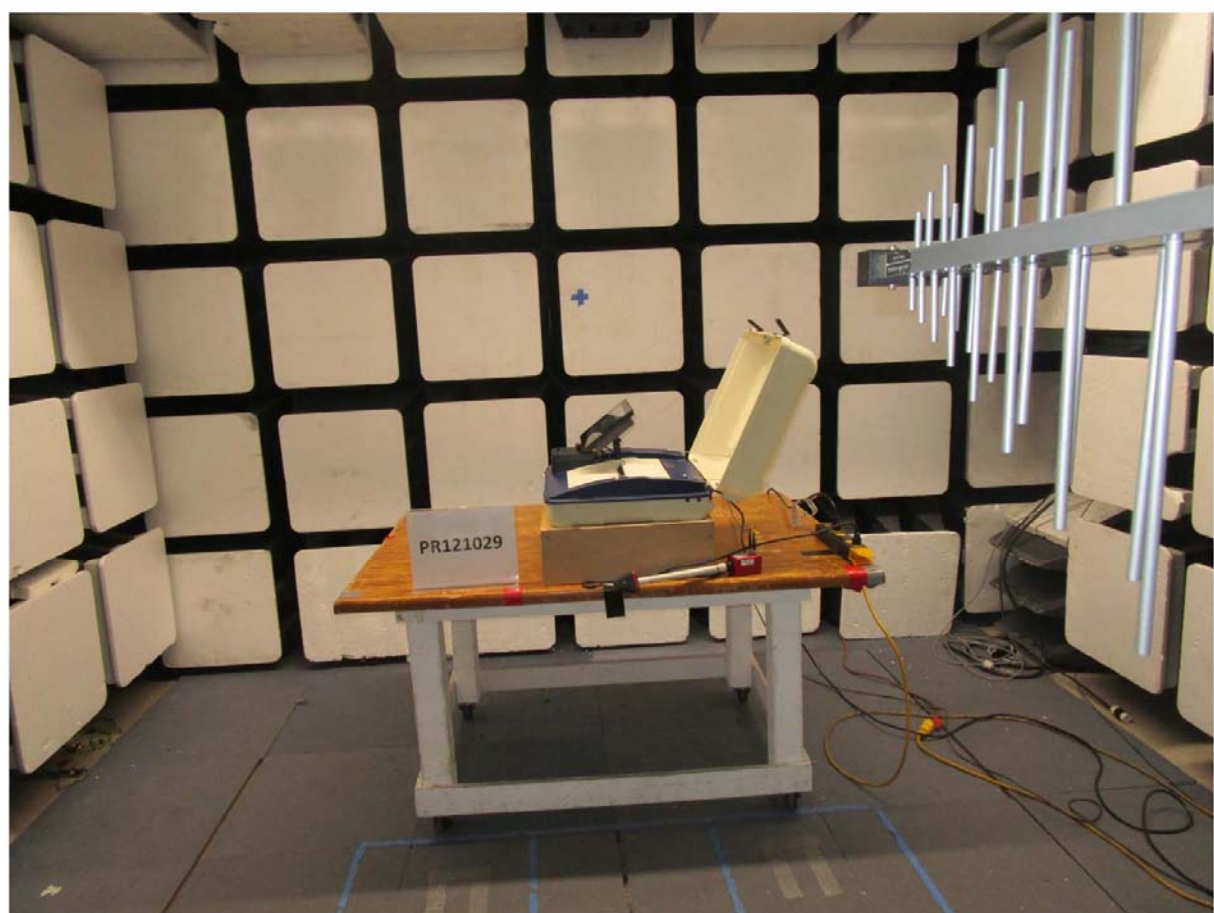


Figure B2. Radiated RF Immunity Test Setup – Right Side.

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

Manufacturer:	Unisyn/PrOV&V	Project Number:	PR121029/B80802
Customer Representative:	Michael Walker	Test Area:	GP #0
Model:	FVS	S/N:	VST100115
Standard Referenced:	IEC 61000-4-3	Date:	January 18, 2021

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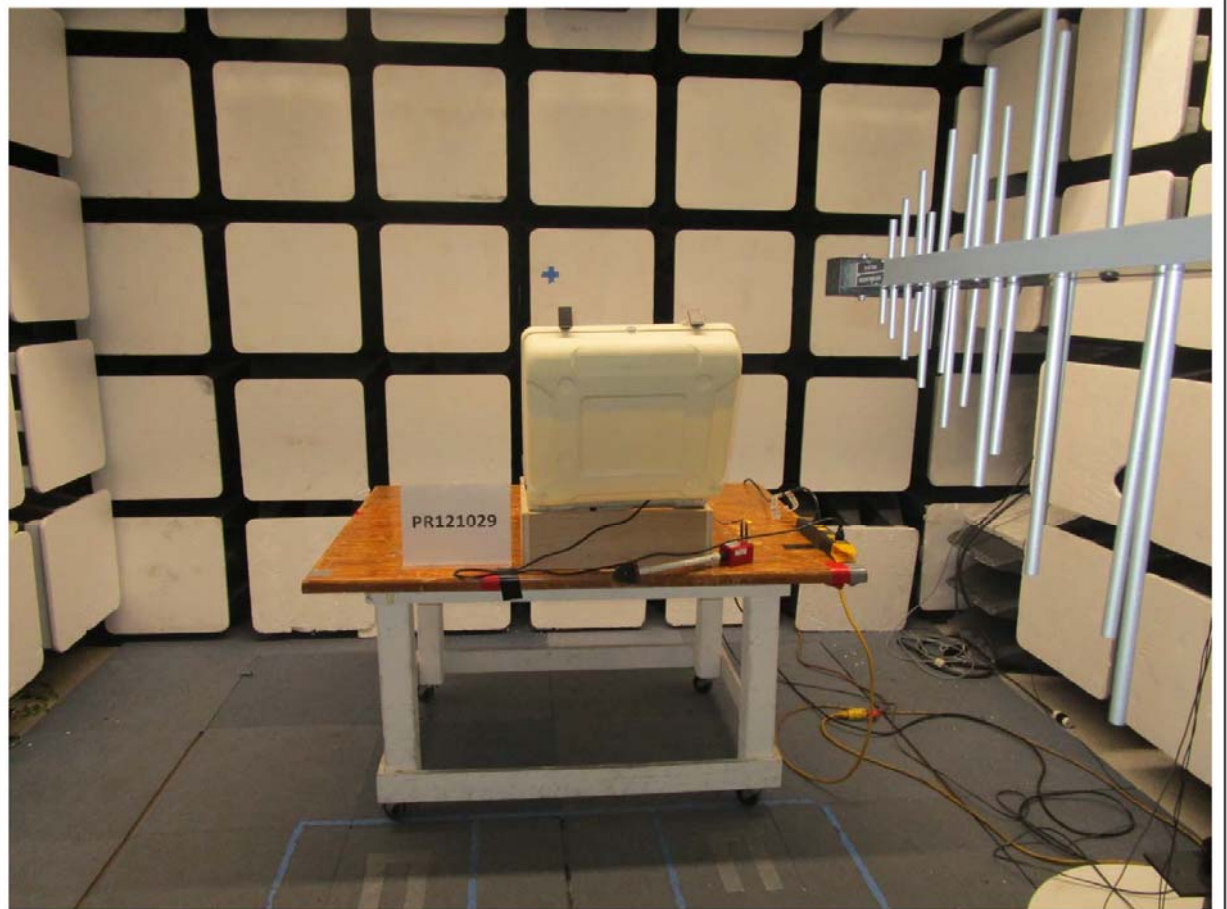


Figure B3. Radiated RF Immunity Test Setup – Back Side.

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

Manufacturer:	Unisyn/PrOV&V	Project Number:	PR121029/B80802
Customer Representative:	Michael Walker	Test Area:	GP #0
Model:	FVS	S/N:	VST100115
Standard Referenced:	IEC 61000-4-3	Date:	January 18, 2021

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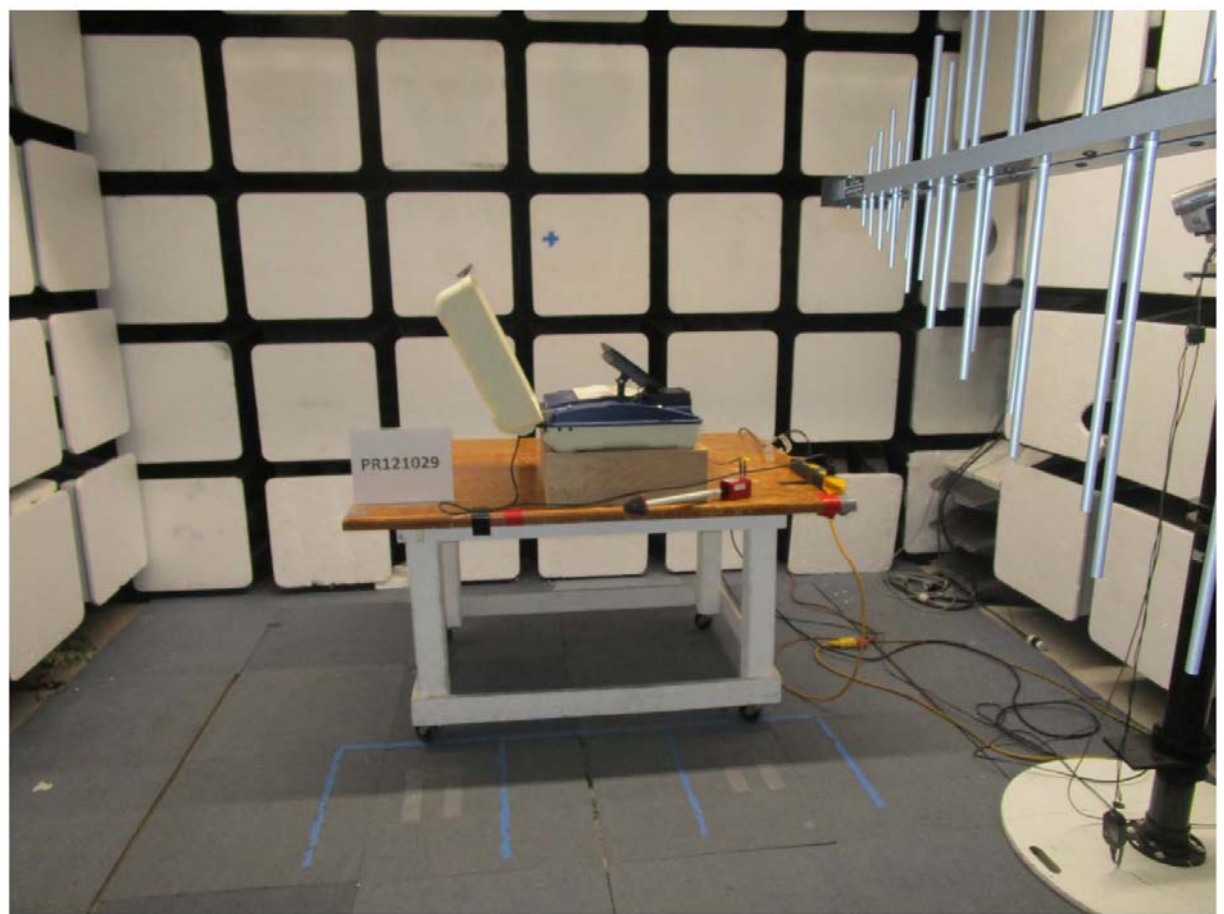


Figure B4. Radiated RF Immunity Test Setup – Left Side.

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

Manufacturer:	<u>Unisyn/PrOV&V</u>	Project Number:	<u>PR121029/B80802</u>
Customer Representative:	<u>Michael Walker</u>	Test Area:	<u>GP #0</u>
Model:	<u>FVS</u>	S/N:	<u>VST100115</u>
Standard Referenced:	<u>IEC 61000-4-3</u>	Date:	<u>January 18, 2021</u>

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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
1454	Giga-tronics	GT-8888A	8888A0338	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
1478	Ophir	5127F	1100	RF Amplifier, 200 Watt, 20 - 1000 MHz	NA	NA
1565	ETS-Lindgren	HI-6053	00166681	Electric Field Probe, 10 MHz - 40 GHz	05/29/2020	05/29/2021
1722	ETS-Lindgren	3142B	1624	Antenna	NA	NA
1761	Braden Shielding Systems	RF Shield Room	N/A	GP0	05/15/2020	05/15/2021
1901	EXTECH	445703	0617	Hygrometer-Thermometer (WC059899)	06/29/2020	06/29/2021



5.3 Electrical Fast Transient / Burst

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

Manufacturer:	Unisyn/Pr0V&V	Project Number:	PR121029/B80802
Customer Representative:	Michael Walker	Test Area:	GP2
Model:	FVS	S/N:	FVS-001
Standard Referenced:	IEC 61000-4-4	Date:	September 17, 2020
Temperature:	23.0°C	Humidity:	33%
Input Voltage:	120Vac/60Hz	Pressure:	843 mb
Configuration of Unit:	Normal Operating Mode		
Test Engineer:	Casey Lockhart		

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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:	<u>Unisyn/PrOV&V</u>	Project Number:	<u>PR121029/B80802</u>
Customer Representative:	<u>Michael Walker</u>	Test Area:	<u>GP2</u>
Model:	<u>FVS</u>	S/N:	<u>FVS-001</u>
Standard Referenced:	<u>IEC 61000-4-3</u>	Date:	<u>September 17, 2020</u>

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Figure C1. Electrical Fast Transient Test Setup.

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

Manufacturer:	Unisyn/PrOV&V	Project Number:	PR121029/B80802
Customer Representative:	Michael Walker	Test Area:	GP2
Model:	FVS	S/N:	FVS-001
Standard Referenced:	IEC 61000-4-3	Date:	September 17, 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:	<u>Unisyn/PrOV&V</u>	Project Number:	<u>PR121029/B80802</u>
Customer Representative:	<u>Michael Walker</u>	Test Area:	<u>GP2</u>
Model:	<u>FVS</u>	S/N:	<u>FVS-001</u>
Standard Referenced:	<u>IEC 61000-4-3</u>	Date:	<u>September 17, 2020</u>

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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
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
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:	Unisyn	Project Number:	PR121029
Customer Representative:	Michael Walker	Test Area:	GP #2
Model:	FVS	S/N:	VST 100 115
Standard Referenced:	EAC 2005 VVSG	Date:	January 12, 2021
Temperature:	24°C	Humidity:	27%
Input Voltage:	120Vac/60Hz	Pressure:	840 mb
Configuration of Unit:	Normal Operating Mode		
Test Engineer:	T. Wittig		

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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		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	45	Differential Mode	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
1.0	x		x			x		0	5	45	Common Mode Line	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



Surge Immunity per IEC / EN 61000-4-5

Manufacturer:	Unisyn		Project Number:	PR121029
Customer Representative:	Michael Walker		Test Area:	GP #2
Model:	FVS		S/N:	VST 100 115
Standard Referenced:	EAC 2005 VVSG		Date:	January 12, 2021
Temperature:	24°C	Humidity:	27%	
Input Voltage:	120Vac/60Hz		Pressure:	840 mb
Configuration of Unit:	Normal Operating Mode			
Test Engineer:	T. Wittig			

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

Surge Immunity per IEC / EN 61000-4-5

Manufacturer:	Unisyn	Project Number:	PR121029
Customer Representative:	Michael Walker	Test Area:	GP #2
Model:	FVS	S/N:	VST 100 115
Standard Referenced:	EAC 2005 VVSG	Date:	January 12, 2021

PR121029-4-5.doc FR0100

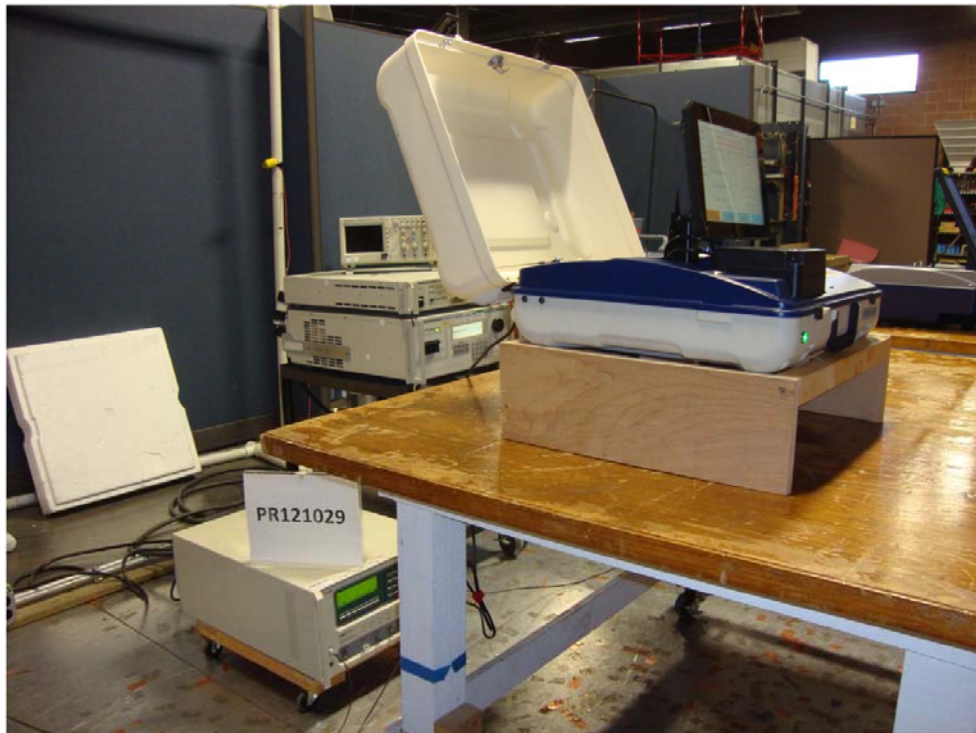


Figure D1. Surge Immunity Test Setup – AC Mains



Surge Immunity per IEC / EN 61000-4-5

Manufacturer:	Unisyn	Project Number:	PR121029
Customer Representative:	Michael Walker	Test Area:	GP #2
Model:	FVS	S/N:	VST 100 115
Standard Referenced:	EAC 2005 VVSG	Date:	January 12, 2021

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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	10/22/2020	10/22/2021
1038	Fluke	85	66180455	Multimeter/Frequency Meter	05/26/2020	05/26/2021
1184	KeyTek	CE Ware	4.0	KeyTek EMC Pro Control Software for EFT, Surge, H-F	NA	NA
1295	California Instruments Corporation	CTS-115-230	S72726	PACS-1 Power Analyzer Compliance Test System (WC05	08/20/2020	08/20/2021
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
1902	EXTECH	445703	1218-1	Hygrometer-Thermometer (WC059900)	06/29/2020	06/29/2021

5.5 Conducted RF Immunity

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

Manufacturer:	Unisyn/Pr0V&V	Project Number:	PR121029/B80802
Customer Representative:	Michael Walker	Test Area:	GP2
Model:	FVS	S/N:	FVS-001
Standard Referenced:	IEC 61000-4-6	Date:	September 16, 2020
Temperature:	24.5°C	Humidity:	32%
Input Voltage:	120Vac/60Hz	Pressure:	846 mb
Configuration of Unit:	Normal Operating Mode		
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:	Unisyn/Pr0V&V	Project Number:	PR121029/B80802
Customer Representative:	Michael Walker	Test Area:	GP2
Model:	FVS	S/N:	FVS-001
Standard Referenced:	IEC 61000-4-6	Date:	September 16, 2020

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Figure E1. Conducted RF Immunity Test Setup.

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

Manufacturer:	Unisyn/PrOV&V	Project Number:	PR121029/B80802
Customer Representative:	Michael Walker	Test Area:	GP2
Model:	FVS	S/N:	FVS-001
Standard Referenced:	IEC 61000-4-6	Date:	September 16, 2020

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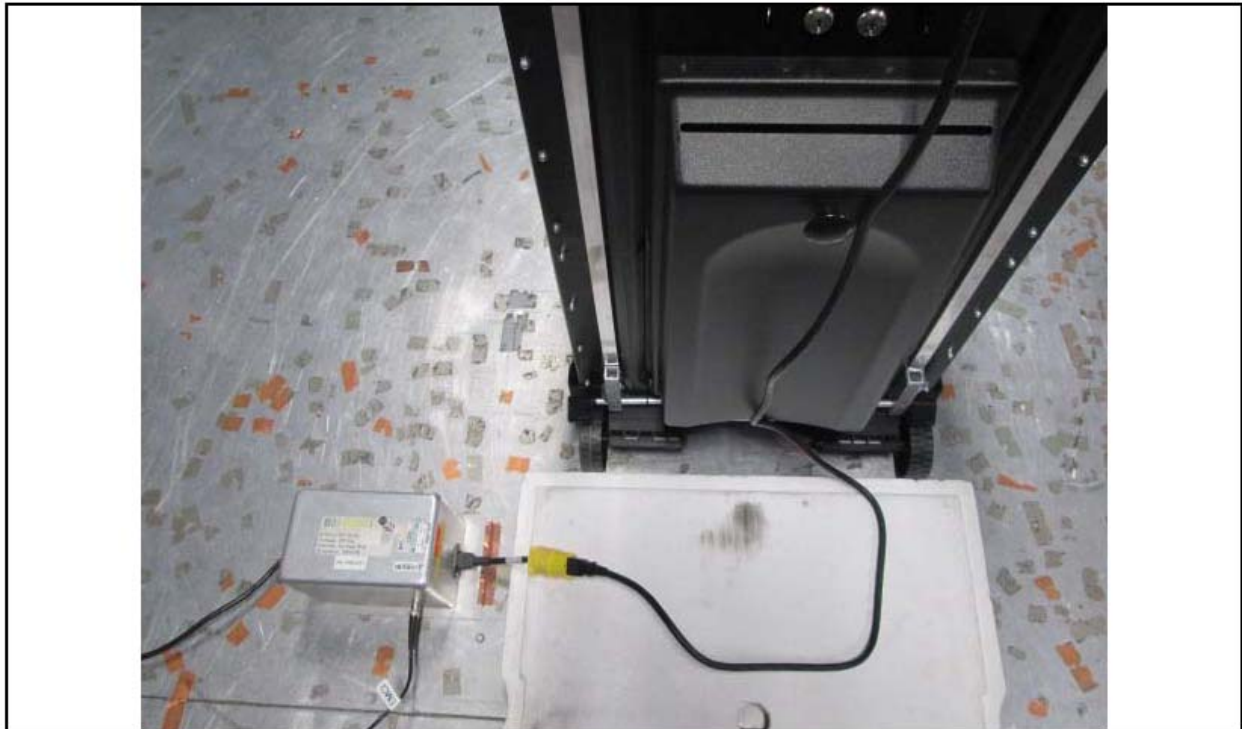


Figure E2. Conducted RF Immunity Test Setup – AC Mains.



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

Manufacturer:	Unisyn/PrOV&V	Project Number:	PR121029/B80802
Customer Representative:	Michael Walker	Test Area:	GP2
Model:	FVS	S/N:	FVS-001
Standard Referenced:	IEC 61000-4-6	Date:	September 16, 2020

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Test Equipment List

ID Number	Manufacturer	Model #	Serial #	Description	Cal Date	Cal Due
1055	Marconi	2024	112113/027	Signal Generator (10 kHz - 2.4 GHz) WC059595	05/27/2020	05/27/2021
1226	EMCI	EMCI-CDN-M3-16	EMCI011	M3 CDN, 16A, 250 VAC	10/24/2019	10/24/2020
1274	IFI	M100	L594-0108	100W Power Amplifier, 0.01 MHz to 220 MHz	NA	NA
1526	Aeroflex/Wein schel	40-6-34	RX850	Hi power attenuator 6dB	10/24/2019	10/24/2020
1533	Werlatone	C9475	102544	100 Watt Dual Directional Coupler, 10 kHz to 250 M	10/24/2019	10/24/2020
1547	Rigol Technologies, Inc	DSA815	DSA8A160300184	9 kHz to 1.5 GHz Spectrum Analyzer (WC059656)	05/09/2020	05/09/2021
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:	Unisyn/PrOV&V	Project Number:	PR121029/B80802
Customer Representative:	Michael Walker	Test Area:	GP2
Model:	FVS	S/N:	FVS-001
Standard Referenced:	IEC 61000-4-8	Date:	September 17, 2020
Temperature:	25.1 °C	Humidity:	39%
Input Voltage:	120Vac/60Hz	Pressure:	843 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		A	Pass
	x	30	Front	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
x		30	Right	60		A	Pass
	x	30	Right	60		A	Pass

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

Manufacturer:	<u>Unisyn/PrOV&V</u>	Project Number:	<u>PR121029/B80802</u>
Customer Representative:	<u>Michael Walker</u>	Test Area:	<u>GP2</u>
Model:	<u>FVS</u>	S/N:	<u>FVS-001</u>
Standard Referenced:	<u>IEC 61000-4-8</u>	Date:	<u>September 17, 2020</u>

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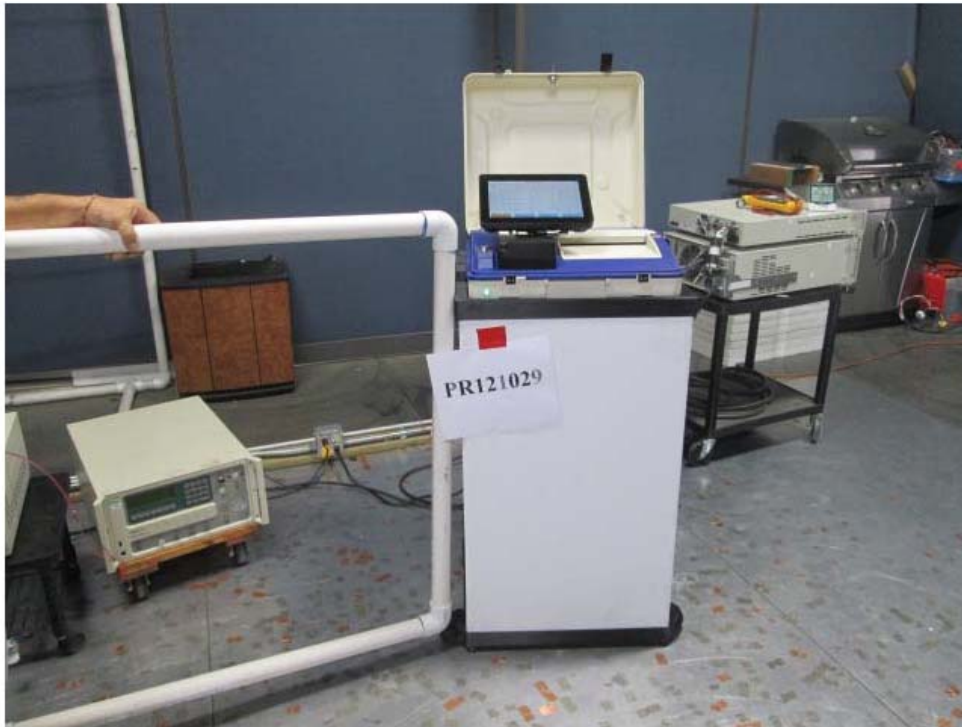


Figure F1. Power Frequency H-field Immunity Test Setup.

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

Manufacturer:	Unisyn/PrOV&V	Project Number:	PR121029/B80802
Customer Representative:	Michael Walker	Test Area:	GP2
Model:	FVS	S/N:	FVS-001
Standard Referenced:	IEC 61000-4-8	Date:	September 17, 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:	<u>Unisyn/PrOV&V</u>	Project Number:	<u>PR121029/B80802</u>
Customer Representative:	<u>Michael Walker</u>	Test Area:	<u>GP2</u>
Model:	<u>FVS</u>	S/N:	<u>FVS-001</u>
Standard Referenced:	<u>IEC 61000-4-8</u>	Date:	<u>September 17, 2020</u>

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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/Ametek	1251P	1423A06347	AC Power supply	NA	NA
1718	NTS	1mX1m loop	001	H Loop antenna	NA	NA
1901	EXTECH	445703	0617	Hygrometer-Thermometer (WC059899)	06/29/2020	06/29/2021

5.7 Voltage Dips and Interruptions

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

Manufacturer:	Unisyn/ProV&V	Project Number:	PR121029/B80802
Customer Representative:	Michael Walker	Test Area:	GP2
Model:	FVS	S/N:	FVS-001
Standard Referenced:	IEC 61000-4-11	Date:	September 17, 2020
Temperature:	23.2°C	Humidity:	34%
Input Voltage:	120Vac/60Hz	Pressure:	843 mb
Configuration of Unit:	Normal Operating Mode		
Test Engineer:	Casey Lockhart		

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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%	0.6				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
40%	6				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
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:	Unisyn/Pro V&V	Project Number:	PR121029/B80802
Customer Representative:	Michael Walker	Test Area:	GP2
Model:	FVS	S/N:	FVS-001
Standard Referenced:	IEC 61000-4-11	Date:	September 17, 2020

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Figure G1. Voltage Dips and Interrupts Test Setup.

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

Manufacturer:	Unisyn/Pro V&V	Project Number:	PR121029/B80802
Customer Representative:	Michael Walker	Test Area:	GP2
Model:	FVS	S/N:	FVS-001
Standard Referenced:	IEC 61000-4-11	Date:	September 17, 2020

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Figure G2. Voltage Dips and Interrupts Test Setup.

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

Manufacturer:	Unisyn/ProV&V	Project Number:	PR121029/B80802
Customer Representative:	Michael Walker	Test Area:	GP2
Model:	FVS	S/N:	FVS-001
Standard Referenced:	IEC 61000-4-11	Date:	September 17, 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
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
1901	EXTECH	445703	0617	Hygrometer-Thermometer (WC059899)	06/29/2020	06/29/2021



6.0 Test Log

EMI Test Log

Manufacturer:	ProV&V/Unisyn	Project Number:	PR121029/B80802
Model:	FVS	S/N:	FVS-001
Customer Representative:	Michael Walker		
Standard Referenced:	FCC PART 15, CLASS B		

FR0105

Ground Planes / CALC

Test	Test Code	Date	Event	O T	Time (hrs)	Result	Initials
4-3	---	September 15, 2020 0800 - 0930	Radiated RF Immunity 10V/m, 80 - 1000 MHz, 1% Step, 80% AM, 1kHz sine, 3s dwell, 120/60 VAC Note: Vertical front side, Paper low, printer stopped. Re-loaded paper around 236 Mhz. Re-test from 80Mhz. Same error at 186.		1.5	---	CL
---	---	0930 - 1330	Holding pattern.		4.0	---	CL
---	---	1330 - 1500	Continue Radiated RF Immunity 10V/m, 80 - 1000 MHz, 1% Step, 80% AM, 1kHz sine, 3s dwell, 120/60 VAC Horizontal right side at 152, lost communication with printer. Added ferrite bead to monitor cable.		1.5	---	CL
---	---	1500 - 1530	Holding pattern.		.5	---	CL
---	---	1530 - 1545	Continue Radiated RF Immunity 10V/m, 80 - 1000 MHz, 1% Step, 80% AM, 1kHz sine, 3s dwell, 120/60 VAC Horizontal right side at 149, lost communication with printer. Moved bead to printer cable.		---	---	CL
		1545 - 1600	Continue Radiated RF Immunity 10V/m, 80 - 1000 MHz, 1% Step, 80% AM, 1kHz sine, 3s dwell, 120/60 VAC Horizontal right side at 331, lost communication with printer.		.5	---	CL
---	---	1600 - 1630	Fixing will continue in the morning.		.5	---	CL
---	---	September 16, 2020 0800 - 1400	Continue Radiated RF Immunity 10V/m, 80 - 1000 MHz, 1% Step, 80% AM, 1kHz sine, 3s dwell, 120/60 VAC Horizontal right side at 193, new error, stopped on scanner doing auto vote. Backed up to 184. Reset back into auto vote mode. Stopped at 621, printer not connected error. Added shielding to ribbon cable. Started back up at 494. Ran to completion. On Category B, lost communication and self-recovered.		6.0	Pass	CL
4-6	---	1500 - 1600	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	---	September 17, 2020 0800 - 0900	Electrical Fast Transient / Burst Mains: +/- 2kV, I/O: +/- 1kV, 120/60 VAC		1.0	Pass	CL
4-11	---	0900 - 1000	Voltage Dips and Interruptions 70% nom, 0.6 cycles / 40% nom, 6 cycles & 1 sec. / 0% nom, 300 cycles, 120/60 VAC		1.0	Pass	CL
4-5	---	1000 - 1500	Surge Immunity Mains: +/- 2kV CM, +/- 2kV DM, (0, 90, 180, 270), 120/60 VAC		5.0	Pass	CL
4-8	---	1500 - 1600	Power Frequency H-Field Immunity 30A/m, 50 / 60 Hz, 3 axes, 120/60 VAC		1.0	Pass	CL
4-11	---	September 18, 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	CL
---	---	1200 - 1600	Voltage Dips and Interruptions (Surge of +/- 15%) Surge of +/- 15% line variation of nominal line voltage, 120/60 VAC		4.0	Pass	CL



End of Report