

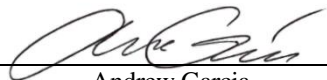
NTS Labs, LLC Test Report for Electromagnetic Interference (EMI) Testing of the HP Printer

Prepared For

Pro V&V, Inc | 1736 Vista View Drive | Longmont, CO 80504

Performed By

NTS Labs, LLC | 1736 Vista View Drive | Longmont, CO 80504-5242 | 303-776-7249 | www.nts.com

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

Andrew Garcia
Preparer

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

Eugene DeVito
Program Manager

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Revision History

Rev.	Description	Issue Date
0	Initial Release	10/28/2022

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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 (EMI) 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.

- Test Specification: EN 61000
- Pro V&V, Inc Purchase Order(s) 2022-016 dated 09/23/2022 and 2022-017 dated 10/06/2022
- NTS Labs, LLC (NTS) Quote(s) OP0626276 dated 09/21/2022
- ISO/17025:2017(E) *General Requirements for the Competence of Testing and Calibration Laboratories*, dated 11/1/2017

3.0 Product Selection and Description

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

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

Item	Qty.	Name/Description	Part Number	Serial Number
1	1	HP Printer	4001dn	VNB0306793
2	1	HP Printer	M404dn	PHDBC16712
3	1	HP Printer	4001dn	VNB0305058
4	1	HP Printer	M404dn	PHDBB31575

3.1 Security Classification

Non-classified

4.0 General Test Requirements

4.1 Test Equipment

The instrumentation used in the performance of these tests is periodically calibrated and standardized within manufacturer's rated accuracies and are traceable to the National Institute of Standards and Technology. The calibration procedures and practices are in accordance with ISO 17025:2017. Certification of calibration is on file subject to inspection by authorized personnel.

4.2 Measurement Uncertainties

ISO/17025 requires that an estimate of the measurement uncertainties associated with the emissions test results be included in the report. The measurement uncertainties given below were calculated using the approach described in CISPR 16-4-2:2003 using a coverage factor of k=2, which gives a level of confidence of approximately 95%. The levels were found to be below levels of CISPR and therefore no adjustment of the data for measurement uncertainty is required.

Table 4.2-1: Measurement Uncertainties

Measurement Type	Measurement Units	Frequency Range	Expanded Uncertainty
Radiated Immunity	V/m	80MHz - 10GHz	-26.3% to 29.97%
ESD	KV	NA	+/- 8.6%
Fast Transients	Voltage	NA	+/- 5.98%
	Time	NA	+/- 8.6%
Surge	Voltage	NA	+/- 4.9%
Conducted Immunity (CDN)	Voltage	NA	-12.6% to 13.3%
Conducted Immunity (BCI)	Voltage	NA	-13.5% to 15.3%
Voltage Dips / Interrupts	Voltage	NA	+/- 2.3%
	Time	NA	+/- 0.08 ms
Magnetic Immunity	Amps	NA	+/- 0.8%
Pulsed Magnetic Immunity	Amps	NA	+/- 9.9%



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	Conducted RF Immunity	EN 61000-4-6 (VVSG 2005)	Longmont	10/18/2022	4001dn	VNB0306793	Passed
5.2	Radiated RF Immunity	EN 61000-4-3 Non-Medical	Longmont	10/18/2022	M404dn	PHDBC16712	Passed
5.3	Conducted RF Immunity	EN 61000-4-6 (VVSG 2005)	Longmont	10/18/2022	M404dn	PHDBC16712	Passed
5.4	Radiated RF Immunity	EN 61000-4-3 Non-Medical	Longmont	10/18/2022 - 10/19/2022	4001dn	VNB0306793	Passed
5.5	Voltage Dips and Interruptions	EN 61000-4-11	Longmont	10/19/2022 - 10/21/2022	4001dn	VNB0305058	Passed
5.6	Voltage Dips and Interruptions	EN 61000-4-11 (VVSG 2005)	Longmont	10/19/2022 - 10/21/2022	M404dn	PHDBC16712	Passed
5.7	Electrical Fast Transient / Burst	EN 61000-4-4	Longmont	10/20/2022	M404dn	PHDBB31575	Passed
5.8	Surge Immunity	EN 61000-4-5 (VVSG 2005)	Longmont	10/20/2022	M404dn	PHDBB31575	Passed
5.9	Electrical Fast Transient / Burst	EN 61000-4-4	Longmont	10/21/2022	4001dn	VNB0306793	Passed
5.10	Surge Immunity	EN 61000-4-5 (VVSG 2005)	Longmont	10/21/2022	4001dn	VNB0306793	Passed
5.11	Electrostatic Discharge	EN 61000-4-2	Longmont	10/21/2022	4001dn	VNB0306793	Passed
5.12	Electrostatic Discharge	EN 61000-4-2	Longmont	10/21/2022	M404dn	PHDBC16712	Passed
5.13	Power Frequency H-Field Immunity	EN 61000-4-8 (VVSG 2005)	Longmont	10/21/2022	4001dn	VNB0305058	Passed
5.14	Power Frequency H-Field Immunity	EN 61000-4-8 (VVSG 2005)	Longmont	10/21/2022	M404dn	PHDBB31575	Passed

The decision rule for Test Results was based on the Test Specification used for testing.

5.1 Conducted RF Immunity

5.1.1 Test Procedure

EN 61000-4-6 (VVSG 2005)

5.1.2 Test Result

Passed

5.1.3 Test Datasheets

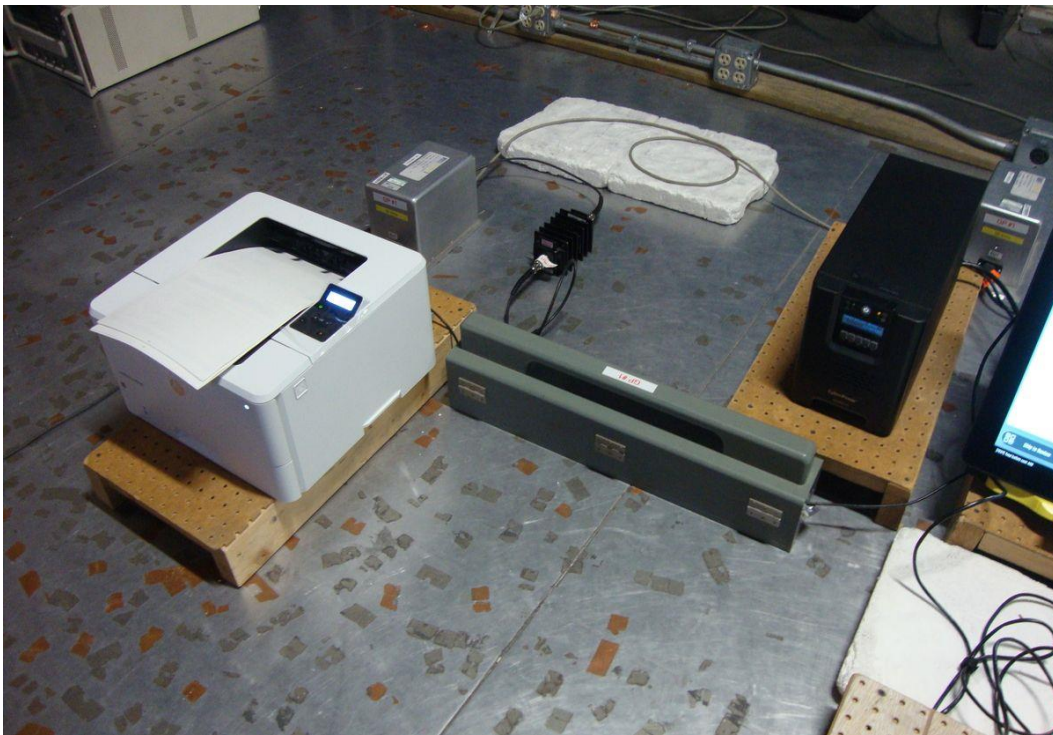
National Technical Systems				
Conducted RF Immunity per IEC / EN 61000-4-6				
Standard Referenced: <u>VVSG 2005</u>		Date: <u>10/18/2022</u>		
Temperature: <u>21°C</u>		Humidity: <u>26%</u>	Pressure: <u>842 mb</u>	
Input Voltage: <u>110Vac/60Hz via UPS</u>				
Configuration of Unit: <u>Printing mode every 15 seconds (Configuration #1)</u>				
Test Engineer: <u>T. Wittig</u>				
Date	Time	Log Entries	Initials	Result
10/18/22	1530	Setup for 4-6 testing on the 4001dn, SN: VNB0306793 printer	TW	---
	1545	Begin Conducted RF Immunity. 10Vrms, 0.15 - 80 MHz, 1% Step, 80% AM, 1kHz sine, 3s dwell. 120 VAC / 60 Hz (4.1.2.11)	TW	---
		Completed 4-6 testing on the AC mains		
10/19/22	0810	Resumed testing on the USB cable	TW	---
	0930	Completed 4-6 testing configuration #1	TW	Pass

National Technical Systems								
Conducted RF Immunity per IEC / EN 61000-4-6								
Standard Referenced: <u>VVSG 2005</u>				Date: <u>10/18/2022</u>				
Temperature: <u>21°C</u>		Humidity: <u>26%</u>		Pressure: <u>842 mb</u>				
Input Voltage: <u>110Vac/60Hz via UPS</u>								
Configuration of Unit: <u>Printing mode every 15 seconds (Configuration #1)</u>								
Test Engineer: <u>T. Wittig</u>								
Frequency (MHz)	Modulation			Level (V/m)	Dwell (sec)	Comments	Criteria Met	Pass/Fail
	Type	%	Freq					
0.150 - 80.0	AM	80	1KHz	10	3	AC Mains using M3 CDN	A	Pass
0.150 - 80.0	AM	80	1KHz	10	3	USB Cable using EM Clamp	A	Pass

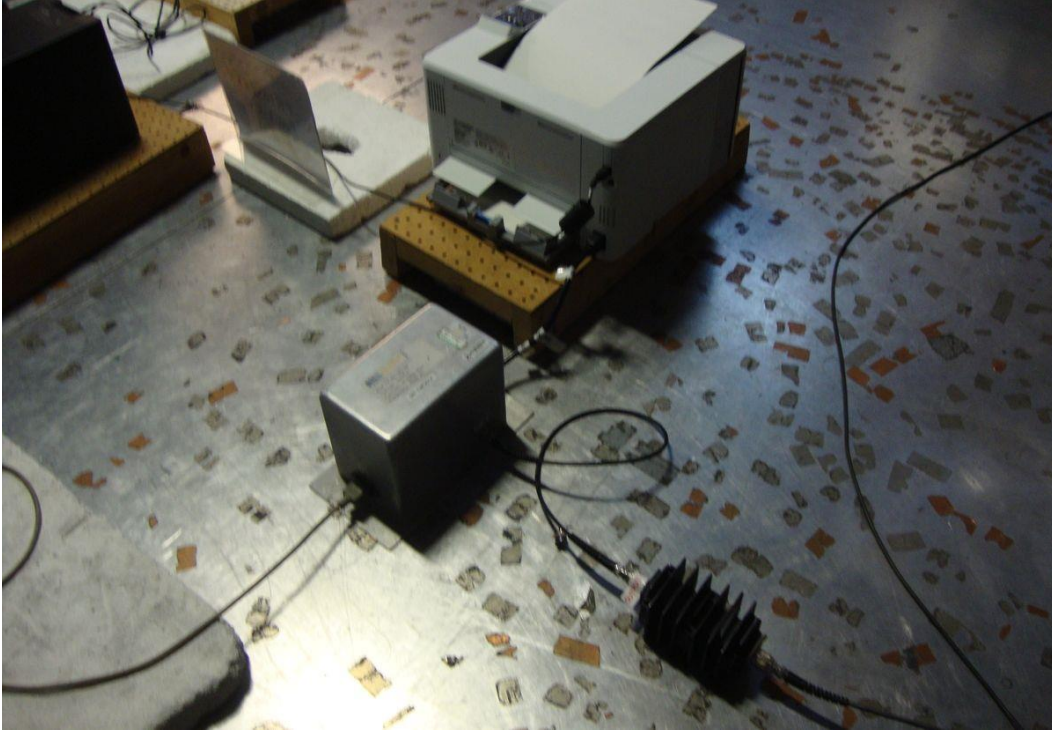
5.1.4 Test Photographs



EN 61000-4-6 Setup Photo



EN 61000-4-6 Setup Photo -I-O cabling



EN 61000-4-6 Setup Photo AC Mains



5.1.5 Test Equipment List

Table 5.1-1: Conducted RF Immunity Test Equipment List

Asset Number	Asset Type	Manufacturer	Model	Calibrated	Due
WC059918	Ground Plane (Fixed)	NTS Labs, LLC	GP #2	NCR	NCR
WC059591	Generator (Signal)	IFR	2023A	06/01/2022	06/01/2023
WC059669	Meter (Digital Multimeter)	Fluke	83-3	09/12/2022	09/12/2023
WC059695	Attenuator (Coaxial)	Aeroflex/Weinschel	40-6-34	02/03/2022	02/03/2023
WC059697	Clamp (Injection)	Fischer Custom Communications	F-2031	02/03/2022	02/03/2023
WC059698	Network (Coupling/Decoupling)	EMC Integrity	EMCI-CDN_M3-16	04/06/2022	02/03/2023
WC059700	Coupler (Bi-Directional)	Werlatone	C9475-13	02/03/2022	02/03/2023
WC059764	Amplifier (Pre/RF/Low Noise)	Amplifier Research	75A250A	04/22/2014	NCR
WC078488	Meter (Hydrometer)	Extech Instruments	Datalogger 42270	06/14/2021	01/19/2023

Calibration Abbreviations

CAL: Calibration

NCR: No Calibration Required



5.2 Radiated RF Immunity

5.2.1 Test Procedure

EN 61000-4-3 Non-Medical

5.2.2 Test Result

Passed

5.2.3 Test Datasheets

Radiated RF Immunity

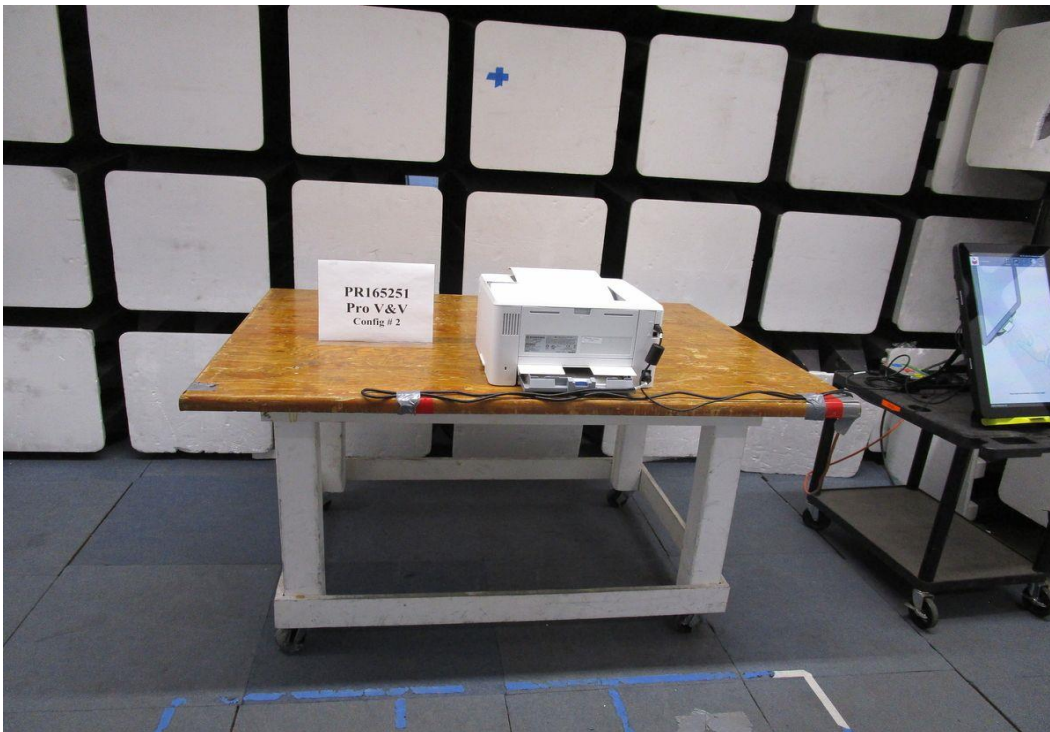
Manufacturer Pro V&V
 Customer Representative Michael Walker
 Model Monitor Printer
 Standard Referenced IEC 61000
 Temperature 24 c
 Humidity 23.20%
 Pressure 842
 Input Voltage 120Vac/60Hz
 Configuration of Unit Processing ballots
 Test Engineer Casey Lockhart
 Project Number PR165251 Config#2
 Test Area GPO
 S/N PHDBC16712
 Date 10/18/2022

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	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

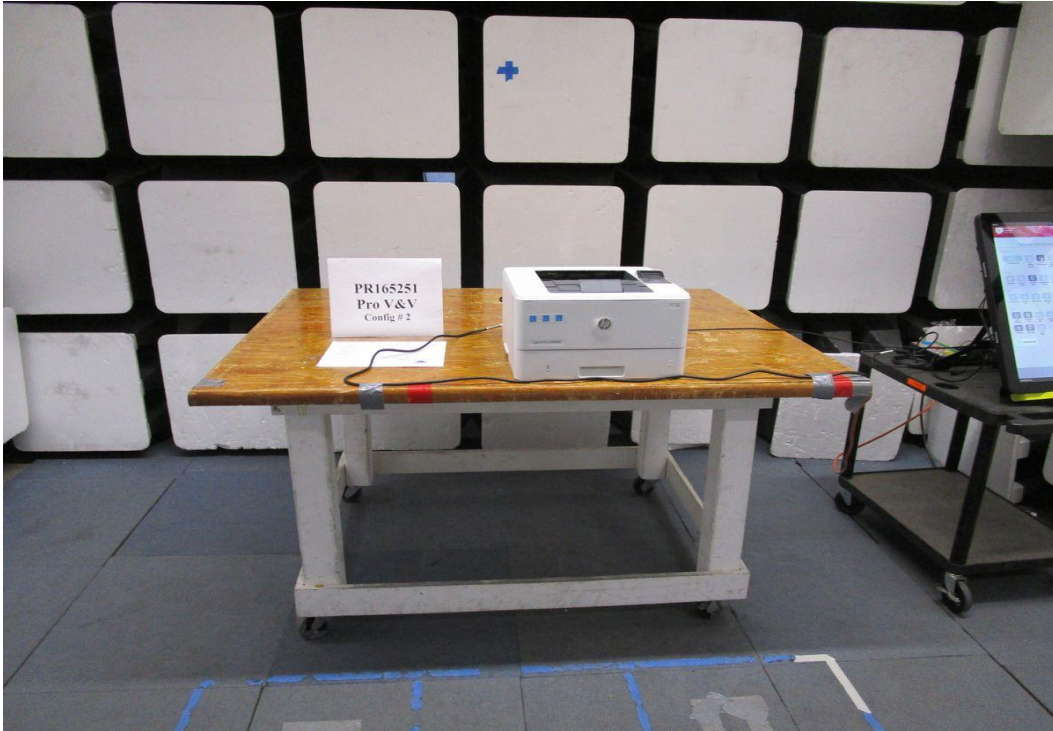
5.2.4 Test Photographs



SN Config 2



EN 61000-4-3 Back+ Config 2



EN 61000-4-3 Front Config 2



EN 61000-4-3 Left+ Config 2



EN 61000-4-3 Right+ Config 2



5.2.5 Test Equipment List

Table 5.2-1: Radiated RF Immunity Test Equipment List

Asset Number	Asset Type	Manufacturer	Model	Calibrated	Due
WC059916	Ground Plane (Fixed)	NTS Labs, LLC	GP #0	NCR	NCR
WC070557	Chamber (EMI, Anechoic)OTA	Braden Shielding Systems (BSS)	GP 0 (RFS Chamber)	05/14/2022	05/14/2023
WC059710	Amplifier (Pre/RF/Low Noise)	Ophir RF	5127F	09/17/2012	NCR
WC059712	Coupler (Bi-Directional)	Werlatone	C3908-10	06/14/2021	NCR
WC059805	Antenna (Log Periodic)	ETS-Lindgren	3142B	NCR	NCR
WC059852	Generator (Signal)	Anritsu Wiltron	69367B	02/15/2022	02/15/2023
WC070467	Meter (Power)	Agilent Technologies	E4418B	02/15/2022	02/15/2023

Calibration Abbreviations

CAL: Calibration

NCR: No Calibration Required

5.3 Conducted RF Immunity

5.3.1 Test Procedure

EN 61000-4-6 (VVSG 2005)

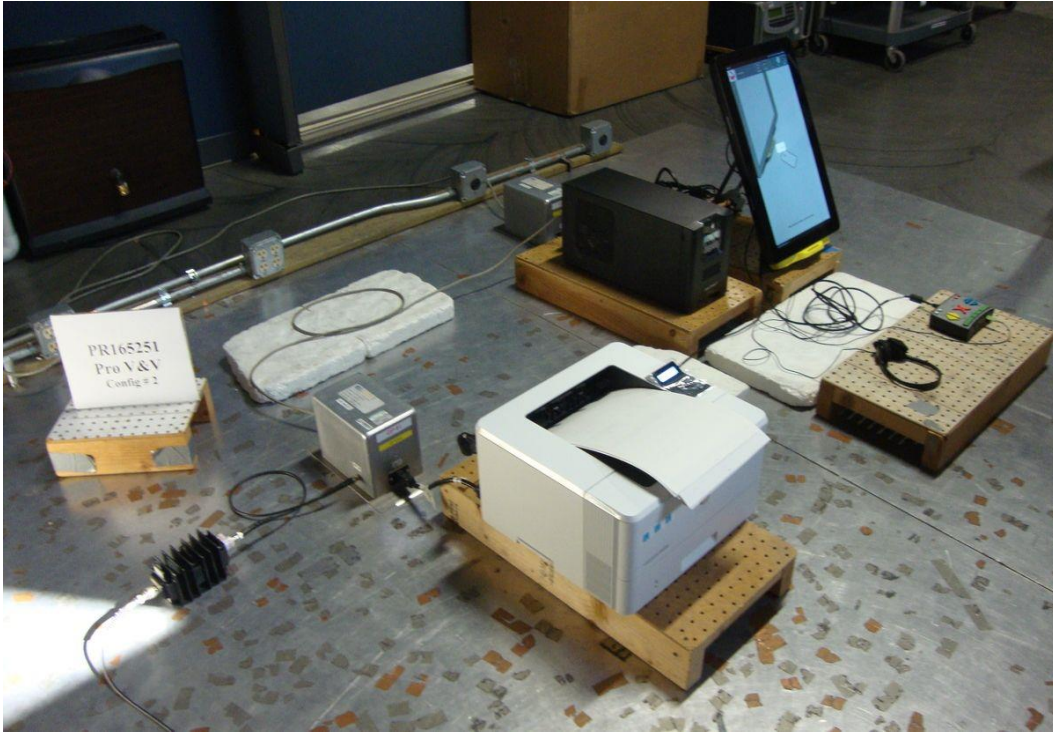
5.3.2 Test Result

Passed

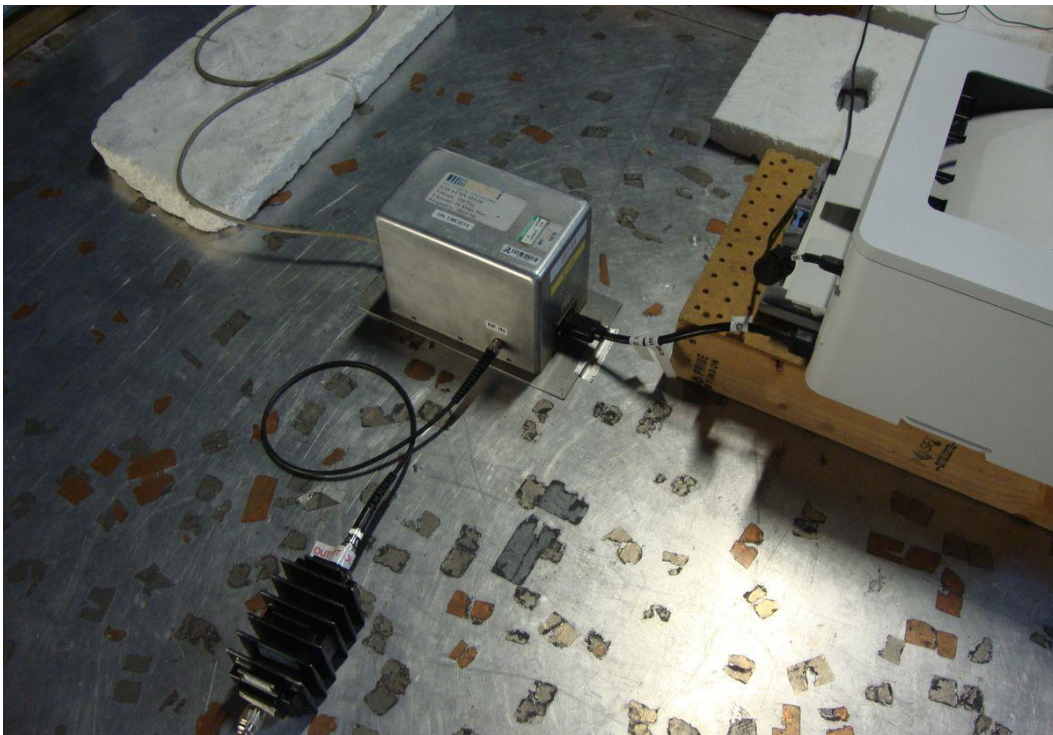
5.3.3 Test Datasheets

National Technical Systems				
Conducted RF Immunity per IEC / EN 61000-4-6				
Standard Referenced: VVSG 2005		Date: 10/18/2022		
Temperature: 21°C	Humidity: 26%	Pressure: 842 mb		
Input Voltage: 110Vac/60Hz via UPS				
Configuration of Unit: Printing mode every 15 seconds (Configuration #2)				
Test Engineer: T. Wittig				
Date	Time	Log Entries	Initials	Result
10/18/22	1000	Setup for 4-6 testing on the M404dn printer	TW	---
	1020	Begin Conducted RF Immunity. 10Vrms, 0.15 - 80 MHz, 1% Step, 80% AM, 1kHz sine, 3s dwell. 120 VAC / 60 Hz (4.1.2.11) AC Mains	TW	---
	1130	Resume testing on the USB cable	TW	---
	1230	Completed 4-6 testing configuration #2	TW	Pass

National Technical Systems								
Conducted RF Immunity per IEC / EN 61000-4-6								
Standard Referenced: VVSG 2005				Date: 10/18/2022				
Temperature: 21°C	Humidity: 26%		Pressure: 842 mb					
Input Voltage: 110Vac/60Hz via UPS								
Configuration of Unit: Printing mode every 15 seconds (Configuration #2)								
Test Engineer: T. Wittig								
Frequency (MHz)	Modulation			Level (V/m)	Dwell (sec)	Comments	Criteria Met	Pass/Fail
	Type	%	Freq					
0.150 - 80.0	AM	80	1KHz	10	3	AC Mains using M3 CDN	A	Pass
0.150 - 80.0	AM	80	1KHz	10	3	USB Cable using EM Clamp	A	Pass

5.3.4 Test Photographs

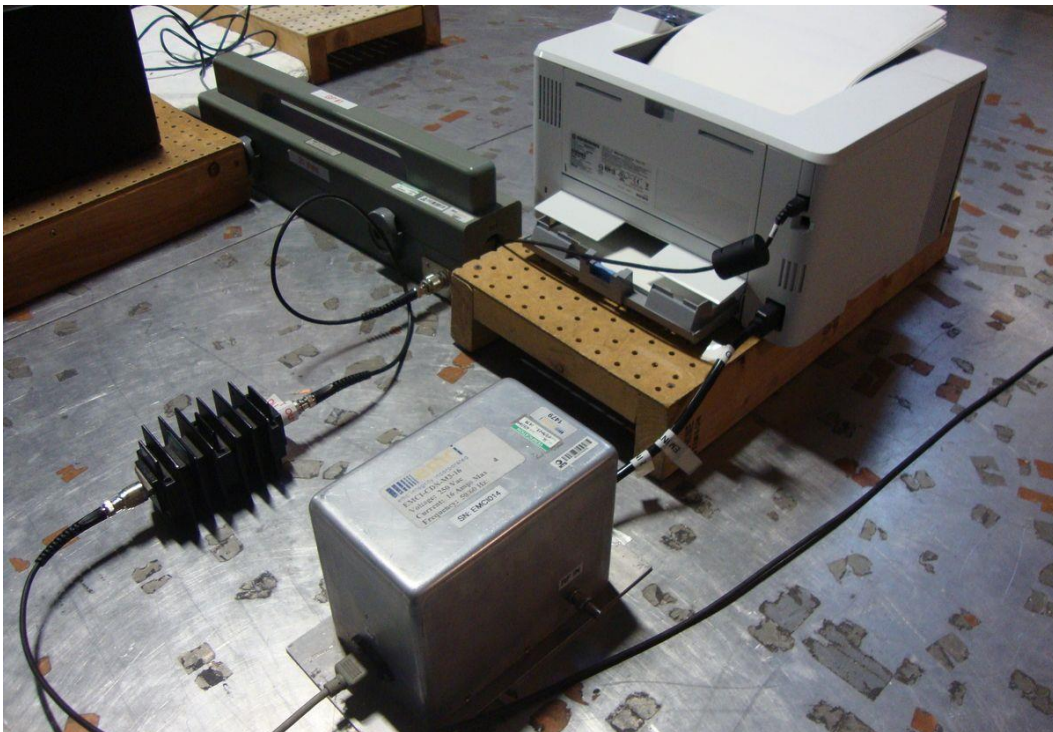
EN 61000-4-6 Setup Photo



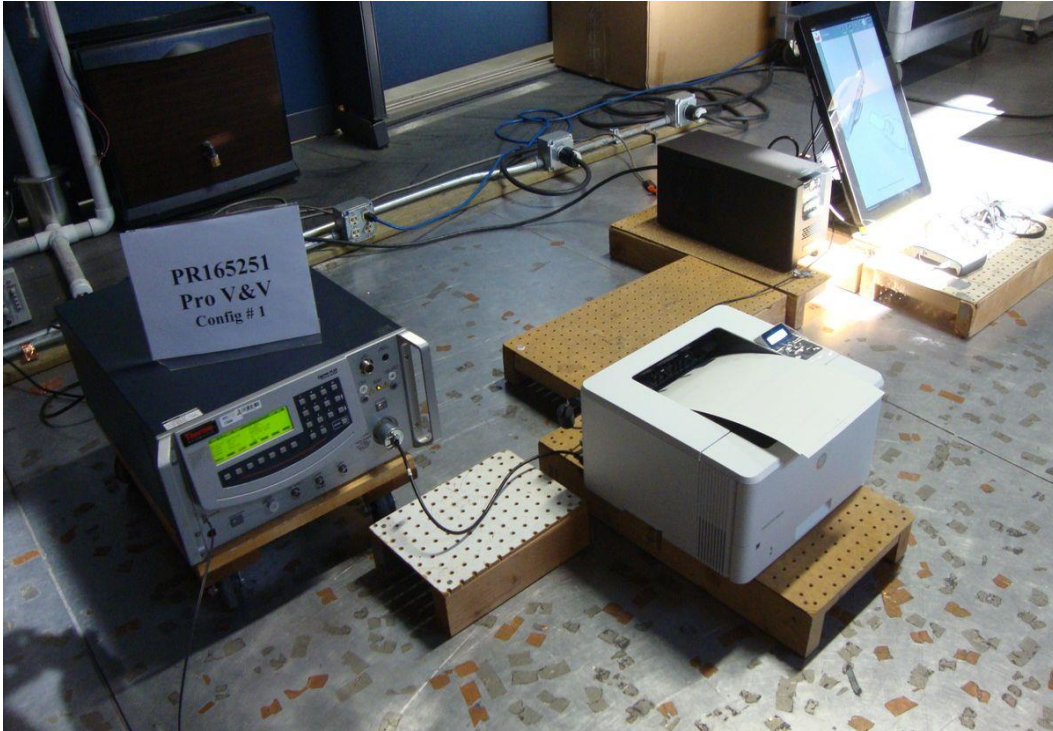
EN 61000-4-6 Setup Photo AC Mains



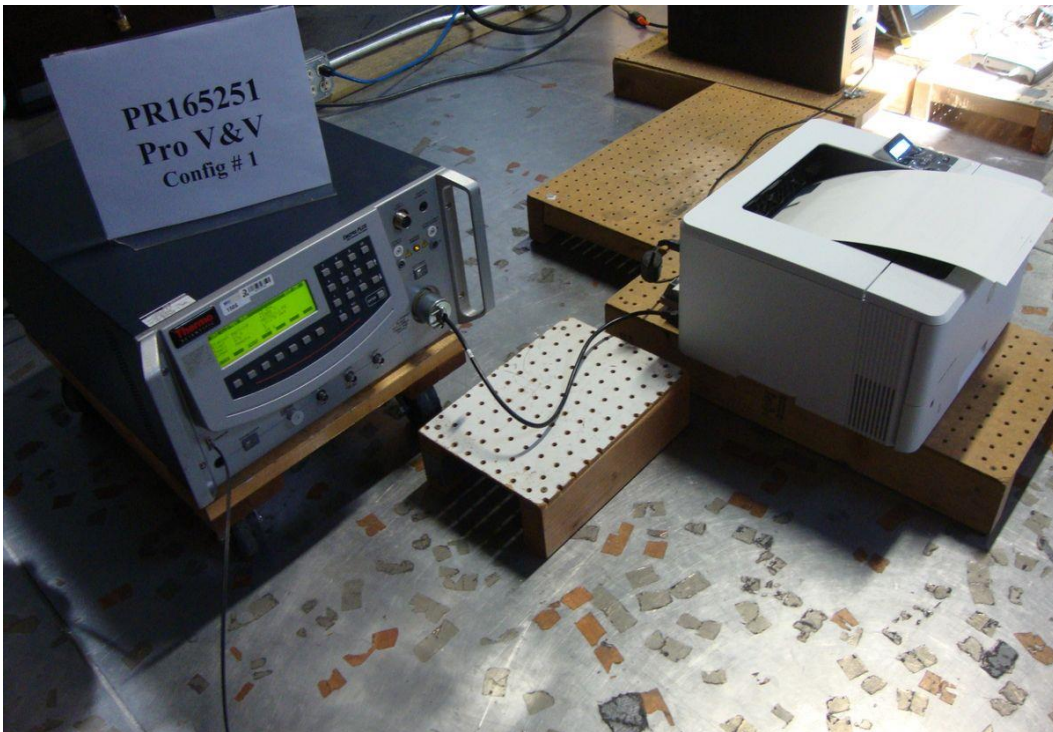
EN 61000-4-6 Setup Photo I-O Cabling



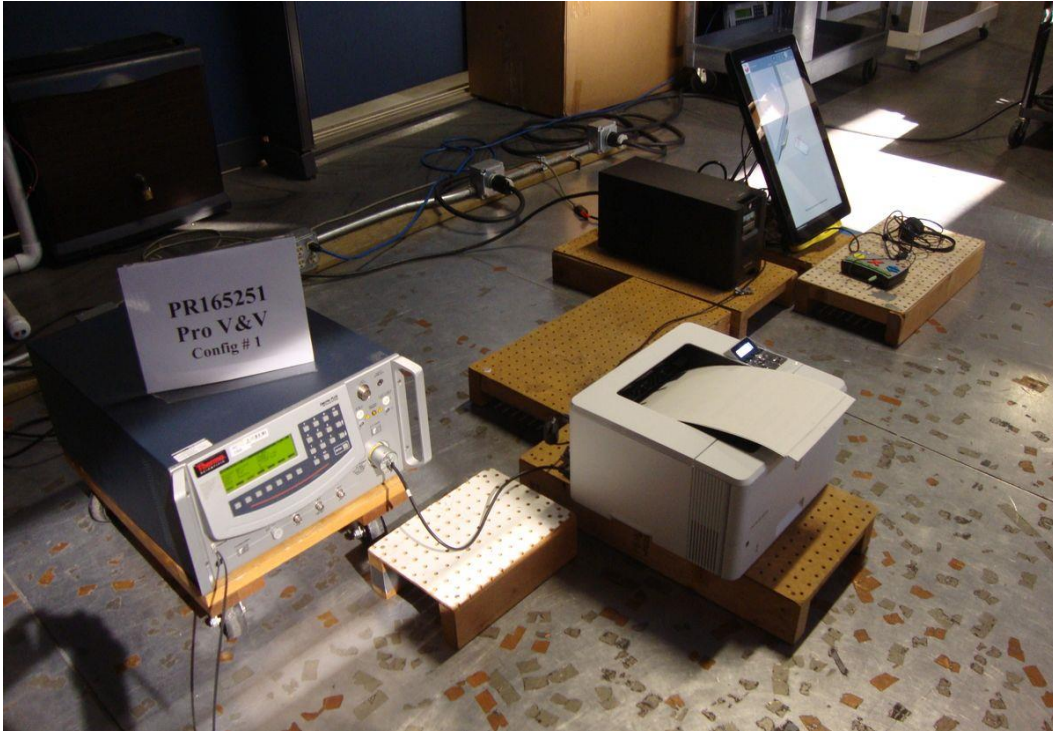
EN 61000-4-6 I-O Cabling 001



EN 61000-4-5 Config 1 001



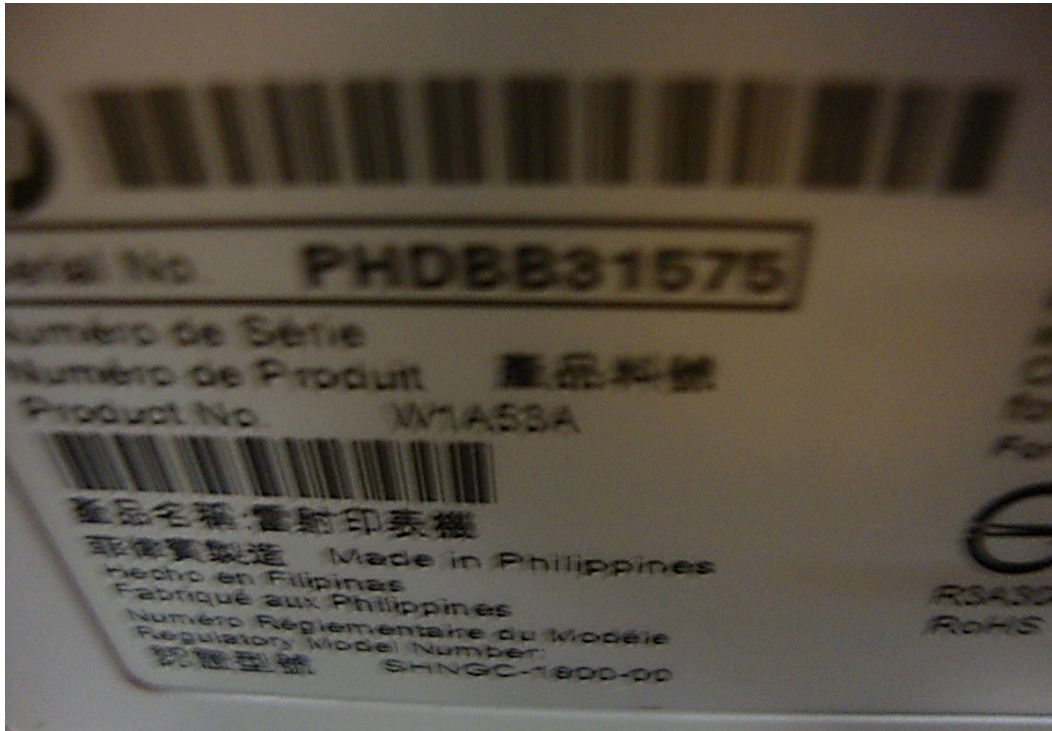
EN 61000-4-5 Config 1 002



EN 61000-4-5 Setup Photo



EN 61000-4-5 Config #2 001



EN 61000-4-5 Config #2 002



5.3.5 Test Equipment List

Table 5.3-1: Conducted RF Immunity Test Equipment List

Asset Number	Asset Type	Manufacturer	Model	Calibrated	Due
WC059918	Ground Plane (Fixed)	NTS Labs, LLC	GP #2	NCR	NCR
WC059591	Generator (Signal)	IFR	2023A	06/01/2022	06/01/2023
WC059669	Meter (Digital Multimeter)	Fluke	83-3	09/12/2022	09/12/2023
WC059695	Attenuator (Coaxial)	Aeroflex/Weinschel	40-6-34	02/03/2022	02/03/2023
WC059697	Clamp (Injection)	Fischer Custom Communications	F-2031	02/03/2022	02/03/2023
WC059698	Network (Coupling/Decoupling)	EMC Integrity	EMCI-CDN M3-16	04/06/2022	02/03/2023
WC059700	Coupler (Bi-Directional)	Werlatone	C9475-13	02/03/2022	02/03/2023
WC059764	Amplifier (Pre/RF/Low Noise)	Amplifier Research	75A250A	04/22/2014	NCR
WC059772	Analyzer (Spectrum)	Rigol Technologies	DSA815	06/14/2022	06/14/2023
WC078488	Meter (Hydrometer)	Extech Instruments	Datalogger 42270	06/14/2021	01/19/2023

Calibration Abbreviations

CAL: Calibration

NCR: No Calibration Required



5.4 Radiated RF Immunity

5.4.1 Test Procedure

EN 61000-4-3 Non-Medical

5.4.2 Test Result

Passed

5.4.3 Test Datasheets

Radiated RF Immunity

Manufacturer Pro V&V
 Customer Representative Michael Walker
 Model Monitor Printer
 Standard Referenced IEC 61000
 Temperature 17.9 c
 Humidity 29.6
 Pressure 842
 Input Voltage 120Vac/60Hz
 Configuration of Unit Processing ballots
 Test Engineer Casey Lockhart
 Project Number PR165251
 Test Area GPO
 S/N Config#1
 Date 10/18/2022

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	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

Test	Date	Event	Time (hrs)	Result	Initials
3-Apr	18-Oct-22 0730 - 1400	Radiated RF Immunity 10V/m, 80 - 1000 MHz, 1% Step, 80% AM, 1kHz sine, 3s dwell 120 VAC / 60 Hz (4.1.2.10) Config#1 (S/N VNB0306793) Note: We had USB errors with the monitor outside the chamber. At 122 MHz front side Horizontal, with a long USB cable with an extender we got USB errors. Copper cloth was placed on the cable connection, an Emclap to no avail. One the monitor was placed inside we had no issue. Repeated the test from beginning.	6.5	Pass	CL
---	1400 - 1500	Waiting on Config#2 to finish CE tests.	1	---	CL
3-Apr	1500 - 1630	Radiated RF Immunity 10V/m, 80 - 1000 MHz, 1% Step, 80% AM, 1kHz sine, 3s dwell 120 VAC / 60 Hz (4.1.2.10) Config#2 (s/n PHDBC16712)	1.5	---	CL
3-Apr	19-Oct-22 0730 - 1100	Continue Radiated RF Immunity 10V/m, 80 - 1000 MHz, 1% Step, 80% AM, 1kHz sine, 3s dwell 120 VAC / 60 Hz (4.1.2.10) Config#2 (s/n PHDBC16712)	3.5	Pass	CL

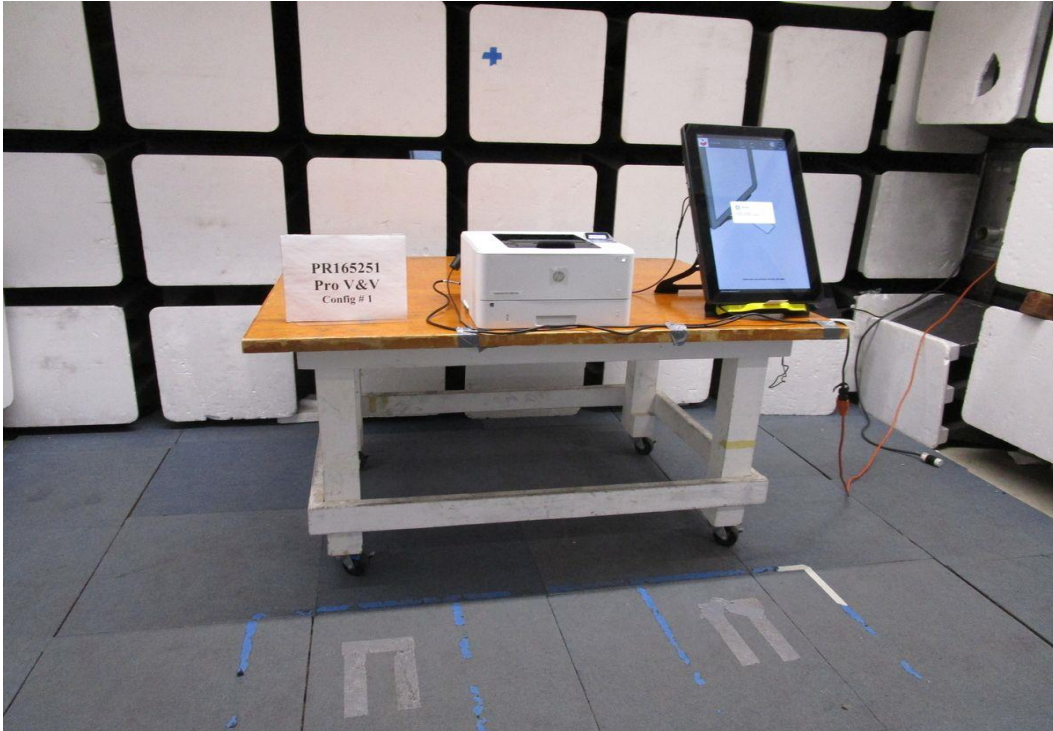
5.4.4 Test Photographs



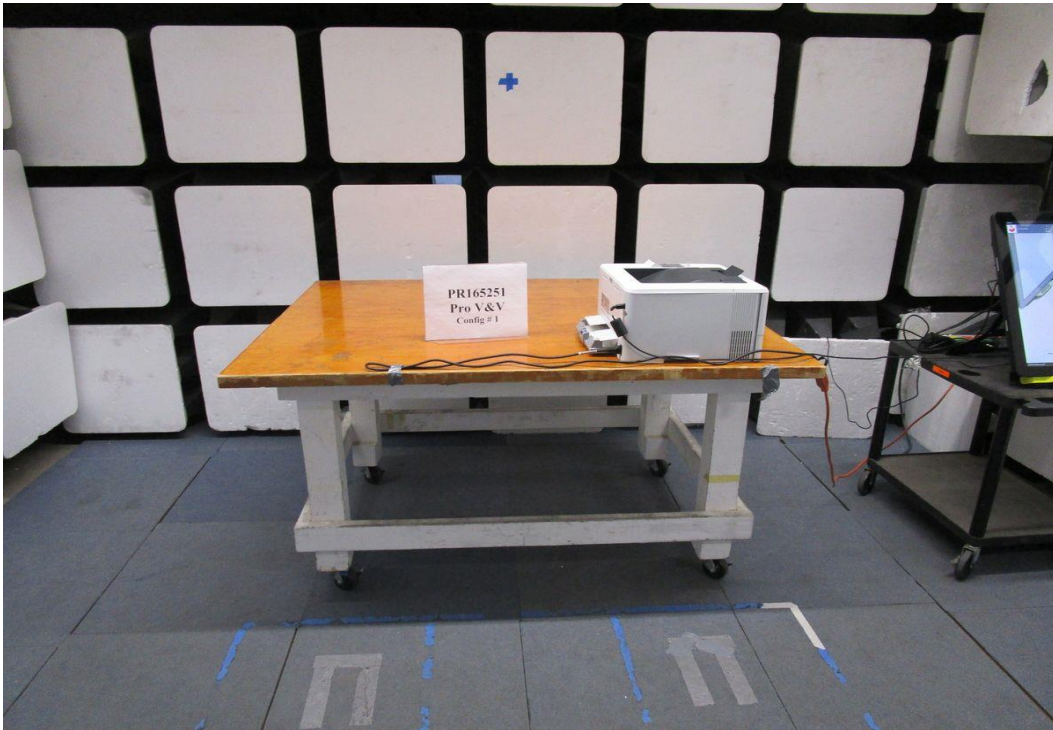
EN 61000-4-3 SN Config 1



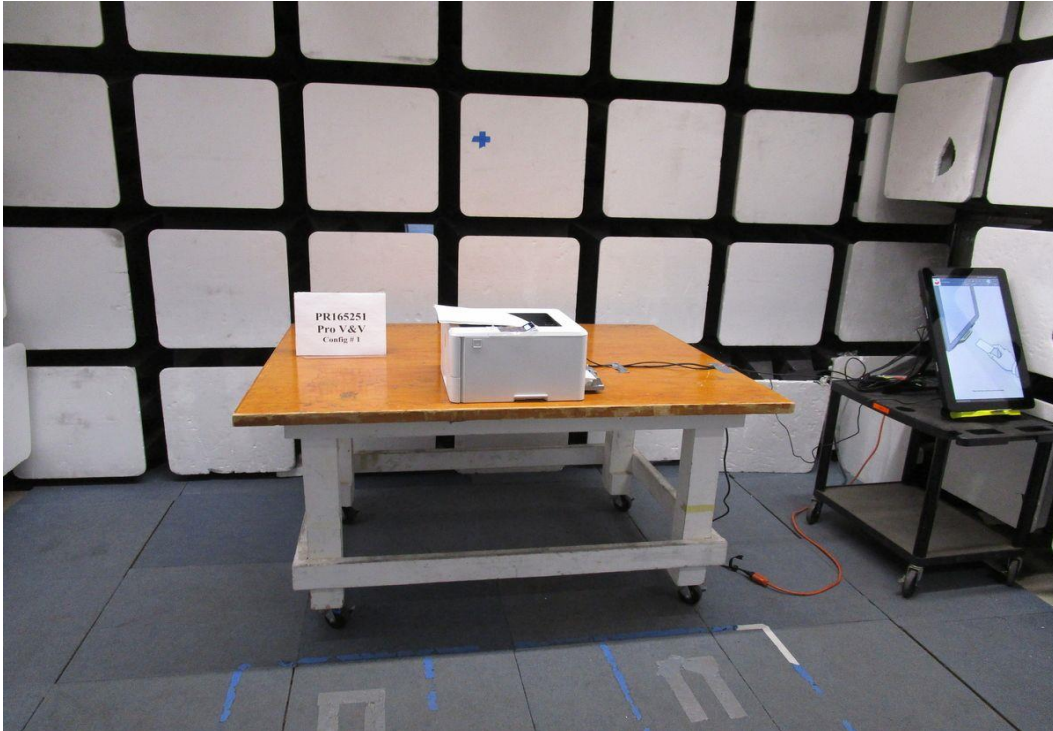
EN 61000-4-3 Back Config 1



EN 61000-4-3 Front Config 1



EN 61000-4-3 Left Config 1



EN 61000-4-3 Right Config 1



5.4.5 Test Equipment List

Table 5.4-1: Radiated RF Immunity Test Equipment List

Asset Number	Asset Type	Manufacturer	Model	Calibrated	Due
WC059916	Ground Plane (Fixed)	NTS Labs, LLC	GP #0	NCR	NCR
WC070557	Chamber (EMI, Anechoic)OTA	Braden Shielding Systems (BSS)	GP 0 (RFS Chamber)	05/14/2022	05/14/2023
WC059710	Amplifier (Pre/RF/Low Noise)	Ophir RF	5127F	09/17/2012	NCR
WC059712	Coupler (Bi-Directional)	Werlatone	C3908-10	06/14/2021	NCR
WC059805	Antenna (Log Periodic)	ETS-Lindgren	3142B	NCR	NCR
WC059852	Generator (Signal)	Anritsu Wiltron	69367B	02/15/2022	02/15/2023
WC070467	Meter (Power)	Agilent Technologies	E4418B	02/15/2022	02/15/2023
WC078489	Meter (Hydrometer)	Extech Instruments	Datalogger 42270	05/22/2022	05/22/2023

Calibration Abbreviations

CAL: Calibration

NCR: No Calibration Required

5.5 Voltage Dips and Interruptions

5.5.1 Test Procedure

EN 61000-4-11

5.5.2 Test Result

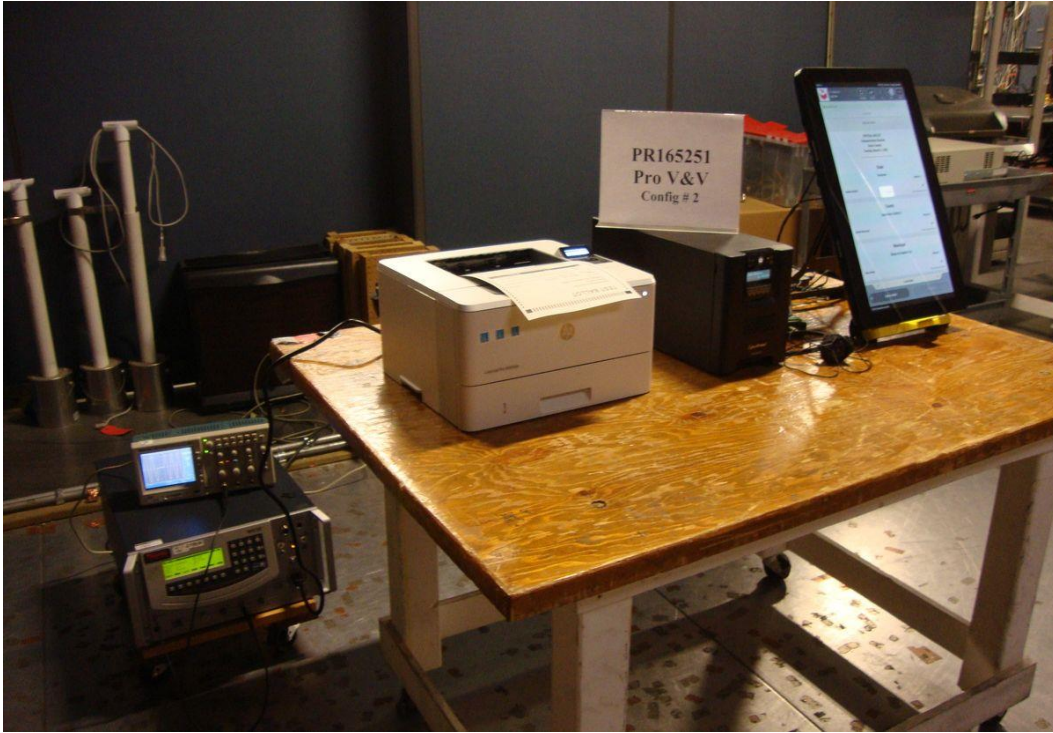
Passed

5.5.3 Test Datasheets

National Technical Systems				
Voltage Dips and Interrupts per IEC / EN 61000-4-11				
Standard Referenced: <u>VVSG 2005</u>		Date: <u>10/19/2022</u>		
Temperature: <u>21°C</u>		Humidity: <u>32%</u>	Pressure: <u>832 mb</u>	
Input Voltage: <u>110Vac/60Hz via UPS</u>				
Configuration of Unit: <u>Printing mode every 4 minutes (Configuration #1)</u>				
Test Engineer: <u>T. Wittig</u>				
Date	Time	Log Entries	Initials	Result
10/19/22	1130	Setup for line voltage variation testing on the 4001dn, SN: VNB0305058	TW	---
		Voltage Dips and Interruptions. Electric power increases of 7.5% and reductions of 12.5% of nominal specified power. 120 VAC / 60 Hz (Inc./Red. of Nom. Voltage) (4.1.2.5)		---
		Surge of +/- 15% line variation of nominal line voltage. 120 VAC / 60 Hz (Surge of +/- 15%) (4.1.2.5)		
	1205	Begin 129Vac Line Voltage Variations (+7.5% of nominal 120V)	TW	Pass
	1405	Begin 105Vac Line Voltage Variations (-12.5% of nominal 120V)	TW	Pass
		Done for the day		---
10/20/22	0815	Surges of +15% line variations of nominal voltage (138V)	TW	Pass
	1015	Surges of -15% line variations of nominal voltage (102V)	TW	Pass
10/21/22	0850	Begin Voltage Dips and Interruptions. 70% nom, 0.6 cycles / 40% nom, 6 cycles & 1 sec. / 0% nom. 300 cycles.	TW	Pass
	0930	Completed 4-11 testing	TW	Pass



National Technical Systems										
Voltage Dips and Interrupts per IEC / EN 61000-4-11										
Standard Referenced: VVSG 2005					Date: 10/19/2022					
Temperature: 21°C			Humidity: 32%			Pressure: 832 mb				
Input Voltage: 110Vac/60Hz via UPS										
Configuration of Unit: Printing mode every 4 minutes (Configuration #1)										
Test Engineer: T. Wittig										
% 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	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 Testing										
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

5.5.4 Test Photographs

VDI Photo



5.5.5 Test Equipment List

Table 5.5-1: Voltage Dips and Interruptions Test Equipment List

Asset Number	Asset Type	Manufacturer	Model	Calibrated	Due
WC059918	Ground Plane (Fixed)	NTS Labs, LLC	GP #2	NCR	NCR
WC059669	Meter (Digital Multimeter)	Fluke	83-3	09/12/2022	09/12/2023
WC059675	Power Supply (AC)	California Instruments	5001IX208-150/300	07/28/2022	07/28/2023
WC059683	Oscilloscope (Digital)	Tektronix	TDS2002B	08/02/2022	08/02/2023
WC059768	Generator (Spike/Transient)	Thermo Fisher Scientific	EMC Pro Plus	11/09/2021	11/09/2022
WC070508	Software	Keytek	CEWare	NCR	NCR

Calibration Abbreviations

CAL: Calibration

NCR: No Calibration Required

5.6 Voltage Dips and Interruptions

5.6.1 Test Procedure

EN 61000-4-11 (VVSG 2005)

5.6.2 Test Result

Passed

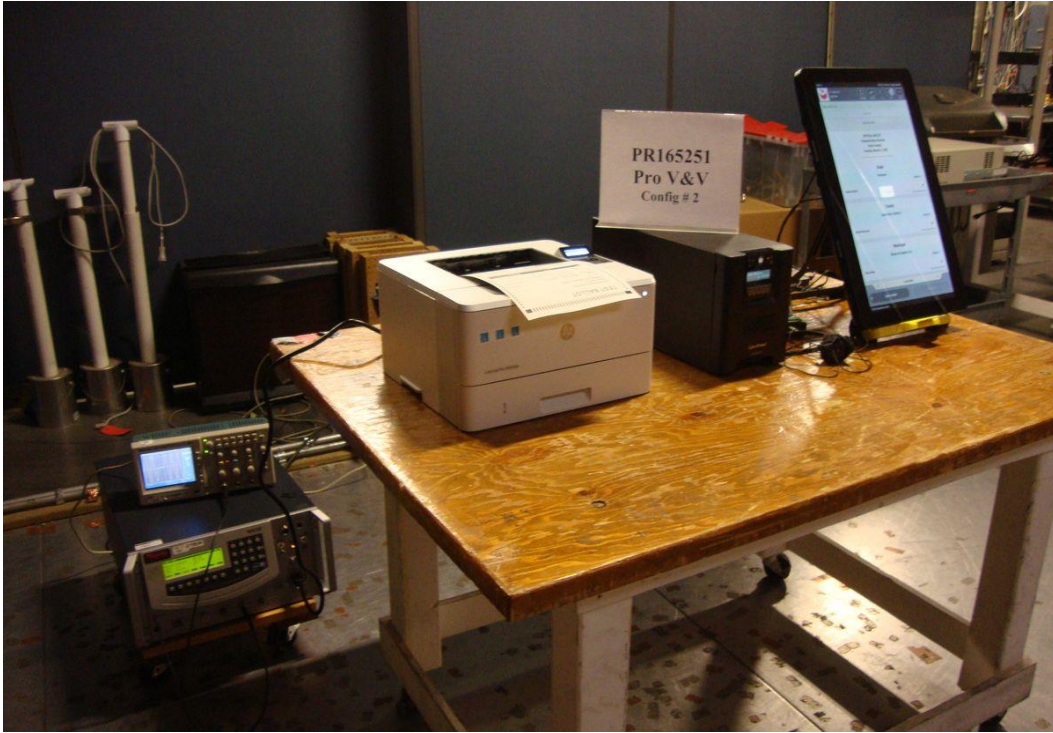
5.6.3 Test Datasheets

National Technical Systems				
Voltage Dips and Interrupts per IEC / EN 61000-4-11				
Standard Referenced: <u>VVSG 2005</u>		Date: <u>10/19/2022</u>		
Temperature: <u>21°C</u>		Humidity: <u>32%</u>	Pressure: <u>832 mb</u>	
Input Voltage: <u>120Vac/60Hz</u>				
Configuration of Unit: <u>Printing mode every 4 minutes (Configuration #2)</u>				
Test Engineer: <u>T. Wittig</u>				
Date	Time	Log Entries	Initials	Result
10/19/22	1130	Setup for line voltage variation testing on the M404dn, SN: PHDBC16712	TW	---
	1205	Begin Voltage Dips and Interruptions. Electric power increases of 7.5% and reductions of 12.5% of nominal specified power. 120 VAC / 60 Hz (Inc./Red. of Nom. Voltage) (4.1.2.5) Surge of +/- 15% line variation of nominal line voltage. 120 VAC / 60 Hz (Surge of +/- 15%) (4.1.2.5)	TW	---
	1405	Begin 129Vac Line Voltage Variations (+7.5% of nominal 120V)	TW	Pass
		Begin 105Vac Line Voltage Variations (-12.5% of nominal 120V)	TW	Pass
	1630	Done for the day		---
10/20/22	0815	Surges of +15% line variations of nominal voltage (138V)	TW	Pass
	1015	Surges of -15% line variations of nominal voltage (102V)	TW	Pass
	0800	Performed 4-11 pre-test verification	TW	---
10/21/22	0840	Begin Voltage Dips and Interruptions. 70% nom, 0.6 cycles / 40% nom, 6 cycles & 1 sec. / 0% nom, 300 cycles. 120 VAC / 60 Hz (4.1.2.5)	TW	---
	0900	Completed 4-11 testing	TW	Pass

National Technical Systems	
Voltage Dips and Interrupts per IEC / EN 61000-4-11	
Standard Referenced: VVSG 2005	Date: 10/19/2022
Temperature: 21°C	Humidity: 32%
Input Voltage: 120Vac/60Hz	Pressure: 832 mb
Configuration of Unit: Printing mode every 4 minutes (Configuration #2)	
Test Engineer: T. Wittig	

% 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	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 Testing		
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

5.6.4 Test Photographs

EN 61000-4-11 Setup Photo



5.6.5 Test Equipment List

Table 5.6-1: Voltage Dips and Interruptions Test Equipment List

Asset Number	Asset Type	Manufacturer	Model	Calibrated	Due
WC059918	Ground Plane (Fixed)	NTS Labs, LLC	GP #2	NCR	NCR
WC059669	Meter (Digital Multimeter)	Fluke	83-3	09/12/2022	09/12/2023
WC059675	Power Supply (AC)	California Instruments	5001IX208-150/300	07/28/2022	07/28/2023
WC059683	Oscilloscope (Digital)	Tektronix	TDS2002B	08/02/2022	08/02/2023
WC059768	Generator (Spike/Transient)	Thermo Fisher Scientific	EMC Pro Plus	11/09/2021	11/09/2022
WC070508	Software	Keytek	CEWare	NCR	NCR

Calibration Abbreviations

CAL: Calibration

NCR: No Calibration Required



5.7 Electrical Fast Transient / Burst

5.7.1 Test Procedure

EN 61000-4-4

5.7.2 Test Result

Passed

5.7.3 Test Datasheets

National Technical Systems				
Electrical Fast Transient/Burst per IEC / EN 61000-4-4				
Standard Referenced: VVSG 2005		Date: 10/20/2022		
Temperature: 22°C		Humidity: 24%		Pressure: 833 mb
Input Voltage: 110Vac/60Hz via UPS				
Configuration of Unit: Printing mode running every 15 seconds (Configuration #2)				
Test Engineer: T. Wittig				
Date	Time	Log Entries	Initials	Result
	1430	Performed 4-4 pre-test verification	TW	---
	1440	Setup for the M404dn printer, SN: PHDBB31575	TW	---
	1445	Begin Electrical Fast Transient / Burst. Mains: +/- 2kV, I/O: +/- 1kV. 120 VAC / 60 Hz (4, 1, 2, 6)	TW	---
	1500	EUT failed at +2000V, L1, COMM failure with ICX powered by the UPS, client powered ICX to other facility power, EUT fails at -2000V, Neutral	TW	Fail
		Client swapped out ICX (ICX and printer connected to UPS)	TW	Fail
		Re-positioned equipment and cables, lost Comm at +2000v, L1	TW	Fail
		Changed printing mode running every 20 seconds, added ferrite core input power input to printer	TW	---
	1545	Re-ran EFT with ferrite attached to printer power cable w/ ICX connected to facility power not the UPS, ferrite Wurth, PN: 742 700 97	TW	---
	1610	Re-ran EFT with ferrite attached to printer AC cable w/ both connected to UPS, no errors, malfunctions or upsets occurred during the re-test with ferrite attached	TW	Pass
		Completed 4-4 testing	TW	Pass

National Technical Systems												
Electrical Fast Transient/Burst per IEC / EN 61000-4-4												
Standard Referenced: VVSG 2005		Date: 10/20/2022										
Temperature: 22°C		Humidity: 24%				Pressure: 833 mb						
Input Voltage: 110Vac/60Hz via UPS					Capacitive Coupling Clamp Verification			Complete				
Configuration of Unit: Printing mode running every 15 seconds (Configuration #2)												
Test Engineer: T. Wittig												
Voltage (kV)	Polarity +/-	Time (sec)	Injection Type	L1	L2	L3	N	PE	Rep Freq.	Comments	Criteria Met	Pass/Fail
1.0	±	60	CDN	X					100kHz	AC Mains	A	Pass
1.0	±	60	CDN		X				100kHz		A	Pass
1.0	±	60	CDN					X	100kHz		A	Pass
1.0	±	60	CDN		X	X		X	100kHz		A	Pass

5.7.4 Test Photographs

EN 61000-4-4 Setup Photo



5.7.5 Test Equipment List

Table 5.7-1: Electrical Fast Transient / Burst Test Equipment List

Asset Number	Asset Type	Manufacturer	Model	Calibrated	Due
WC059918	Ground Plane (Fixed)	NTS Labs, LLC	GP #2	NCR	NCR
WC059683	Oscilloscope (Digital)	Tektronix	TDS2002B	08/02/2022	08/02/2023
WC059692	Meter (Digital Multimeter)	Fluke	83-3	09/12/2022	09/12/2023
WC059768	Generator (Spike/Transient)	Thermo Fisher Scientific	EMC Pro Plus	11/09/2021	11/09/2022
WC070508	Software	Keytek	CEWare	NCR	NCR
WC078488	Meter (Hydrometer)	Extech Instruments	Datalogger 42270	06/14/2021	01/19/2023

Calibration Abbreviations

CAL: Calibration

NCR: No Calibration Required



5.8 Surge Immunity

5.8.1 Test Procedure

EN 61000-4-5 (VVSG 2005)

5.8.2 Test Result

Passed

5.8.3 Test Datasheets

National Technical Systems				
Surge Immunity per IEC / EN 61000-4-5				
Standard Referenced:		VVSG 2005	Date: 10/20/2022	
Temperature:		21°C	Humidity: 29%	
Input Voltage:		110Vac/60Hz via UPS		
Configuration of Unit:		Printing mode every 4 minutes (Configuration #2)		
Test Engineer:		T. Wittig		
Date	Time	Log Entries	Initials	Result
10/20/22	0800	Performed 4-5 pre-tests verification	TW	---
		Setup the M404dn, SN: PHDBB31575 for surge testing	TW	---
	0815	Begin Surge Immunity. Mains: +/- 2kV CM, +/- 2kV DM, (0, 90, 180, 270) 120 VAC / 60 Hz (4.1.2.7)	TW	---
	1430	Completed 4-5 testing	TW	Pass



National Technical Systems												
Surge Immunity per IEC / EN 61000-4-5												
Standard Referenced: <u>VVSG 2005</u>			Date: <u>10/20/2022</u>									
Temperature: <u>21°C</u>		Humidity: <u>29%</u>		Pressure: <u>832 mb</u>								
Input Voltage: <u>110Vac/60Hz via UPS</u>												
Configuration of Unit: <u>Printing mode every 4 minutes (Configuration #2)</u>												
Test Engineer: <u>T. Wittig</u>												
Voltage (kV)	Polarity +/-	L1	L2	L3	N	PE	Phase (deg)	Number of Pulses	Delay (sec)	Comments	Criteria Met	Pass/Fail
0.5	±	X			X		0	5	30	Differential Mode	A	Pass
0.5	±	X			X		90	5	30		A	Pass
0.5	±	X			X		180	5	30		A	Pass
0.5	±	X			X		270	5	30		A	Pass
0.5	±	X				X	0	5	30	Common Mode Line	A	Pass
0.5	±	X				X	90	5	30		A	Pass
0.5	±	X				X	180	5	30		A	Pass
0.5	±	X				X	270	5	30		A	Pass
0.5	±				X	X	0	5	45	Common Mode Neutral	A	Pass
0.5	±				X	X	90	5	45		A	Pass
0.5	±				X	X	180	5	45		A	Pass
0.5	±				X	X	270	5	45		A	Pass
1.0	±	X			X		0	5	60	Differential Mode	A	Pass
1.0	±	X			X		90	5	60		A	Pass
1.0	±	X			X		180	5	60		A	Pass
1.0	±	X			X		270	5	60		A	Pass
1.0	±	X				X	0	5	60	Common Mode Line	A	Pass
1.0	±	X				X	90	5	60		A	Pass
1.0	±	X				X	180	5	60		A	Pass
1.0	±	X				X	270	5	60		A	Pass
1.0	±				X	X	0	5	60	Common Mode Neutral	A	Pass
1.0	±				X	X	90	5	60		A	Pass
1.0	±				X	X	180	5	60		A	Pass
1.0	±				X	X	270	5	60		A	Pass
2.0	±	X			X		0	5	60	Differential Mode	A	Pass
2.0	±	X			X		90	5	60		A	Pass
2.0	±	X			X		180	5	60		A	Pass
2.0	±	X			X		270	5	60		A	Pass
2.0	±	X				X	0	5	60	Common Mode Line	A	Pass
2.0	±	X				X	90	5	60		A	Pass
2.0	±	X				X	180	5	60		A	Pass
2.0	±	X				X	270	5	60		A	Pass
2.0	±				X	X	0	5	60	Common	A	Pass
2.0	±				X	X	90	5	60		A	Pass

5.8.4 Test Photographs

EN 61000-4-5 Setup Photo



5.8.5 Test Equipment List

Table 5.8-1: Surge Immunity Test Equipment List

Asset Number	Asset Type	Manufacturer	Model	Calibrated	Due
WC059918	Ground Plane (Fixed)	NTS Labs, LLC	GP #2	NCR	NCR
WC059669	Meter (Digital Multimeter)	Fluke	83-3	09/12/2022	09/12/2023
WC059683	Oscilloscope (Digital)	Tektronix	TDS2002B	08/02/2022	08/02/2023
WC059768	Generator (Spike/Transient)	Thermo Fisher Scientific	EMC Pro Plus	11/09/2021	11/09/2022
WC070508	Software	Keytek	CEWare	NCR	NCR
WC078488	Meter (Hydrometer)	Extech Instruments	Datalogger 42270	06/14/2021	01/19/2023

Calibration Abbreviations

CAL: Calibration

NCR: No Calibration Required



5.9 Electrical Fast Transient / Burst

5.9.1 Test Procedure

EN 61000-4-4

5.9.2 Test Result

Passed

5.9.3 Test Datasheets

National Technical Systems				
Electrical Fast Transient/Burst per IEC / EN 61000-4-4				
Standard Referenced: VVSG 2005		Date: 10/21/2022		
Temperature: 22°C	Humidity: 24%	Pressure: 833 mb		
Input Voltage: 110Vac/60Hz via UPS				
Configuration of Unit: Printing mode every 15 seconds (Configuration #1)				
Test Engineer: T. Wittig				
Date	Time	Log Entries	Initials	Result
10/21/22	0800	Performed 4-4 pre-test verification	TW	---
		Setup for the 4001dn, SN: VNB0306793	TW	---
	0815	Begin Electrical Fast Transient / Burst. Mains: +/- 2kV, I/O: +/- 1kV. 120 VAC / 60 Hz (4.1.2.6)	TW	---
	0835	Completed 4-4 testing	TW	Pass

National Technical Systems												
Electrical Fast Transient/Burst per IEC / EN 61000-4-4												
Standard Referenced: VVSG 2005					Date: 10/21/2022							
Temperature: 22°C		Humidity: 24%			Pressure: 833 mb							
Input Voltage: 110Vac/60Hz via UPS					Capacitive Coupling Clamp Verification			Complete				
Configuration of Unit: Printing mode every 15 seconds (Configuration #1)												
Test Engineer: T. Wittig												
Voltage (kV)	Polarity +/-	Time (sec)	Injection Type	L1	L2	L3	N	PE	Rep Freq.	Comments	Criteria Met	Pass/Fail
2.0	±	60	CDN	X					100kHz	AC Mains	A	Pass
2.0	±	60	CDN		X				100kHz		A	Pass
2.0	±	60	CDN					X	100kHz		A	Pass
2.0	±	60	CDN		X	X		X	100kHz		A	Pass

5.9.4 Test Photographs

EN 61000-4-4 Setup Photo



5.9.5 Test Equipment List

Table 5.9-1: Electrical Fast Transient / Burst Test Equipment List

Asset Number	Asset Type	Manufacturer	Model	Calibrated	Due
WC059918	Ground Plane (Fixed)	NTS Labs, LLC	GP #2	NCR	NCR
WC059683	Oscilloscope (Digital)	Tektronix	TDS2002B	08/02/2022	08/02/2023
WC059692	Meter (Digital Multimeter)	Fluke	83-3	09/12/2022	09/12/2023
WC059768	Generator (Spike/Transient)	Thermo Fisher Scientific	EMC Pro Plus	11/09/2021	11/09/2022
WC070508	Software	Keytek	CEWare	NCR	NCR
WC078488	Meter (Hydrometer)	Extech Instruments	Datalogger 42270	06/14/2021	01/19/2023

Calibration Abbreviations

CAL: Calibration

NCR: No Calibration Required



5.10 Surge Immunity

5.10.1 Test Procedure

EN 61000-4-5 (VVSG 2005)

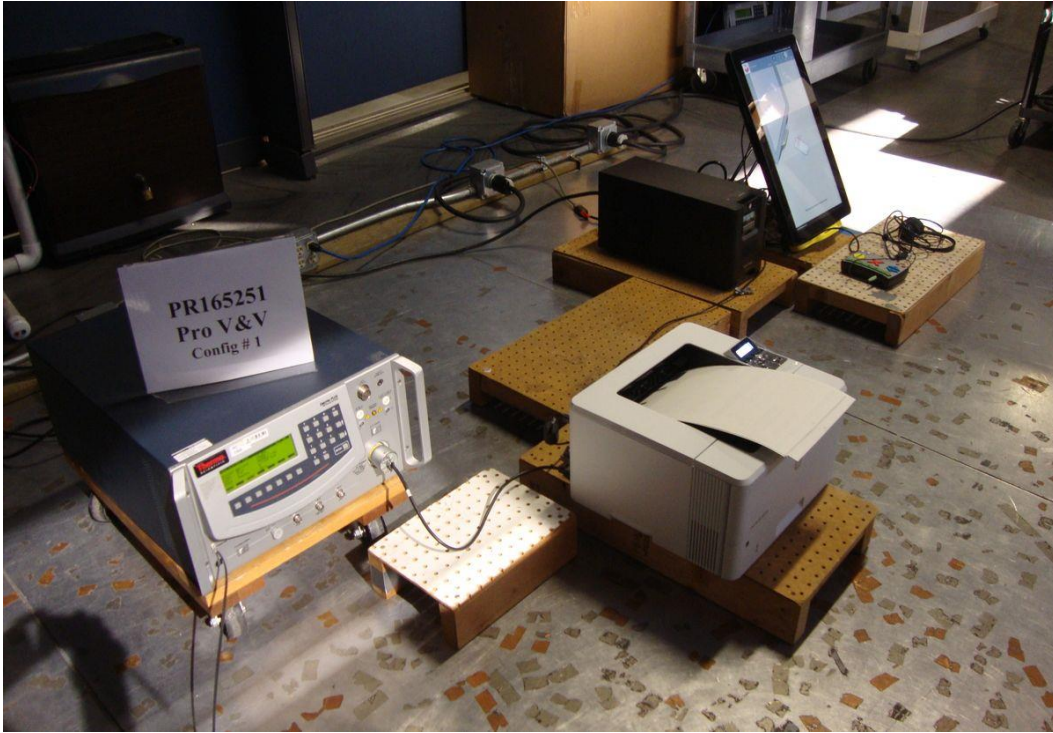
5.10.2 Test Result

Passed

5.10.3 Test Datasheets

National Technical Systems				
Surge Immunity per IEC / EN 61000-4-5				
Standard Referenced: VVSG 2005			Date: 10/19/2022	
Temperature: 21°C		Humidity: 29%		Pressure: 832 mb
Input Voltage: 110Vac/60Hz via UPS				
Configuration of Unit: Printing mode every 4 minutes (Configuration #1)				
Test Engineer: T. Wittig				
Date	Time	Log Entries	Initials	Result
10/19/22	0800	Performed 4-5 pre-test verification	TW	---
		Setup the 4001dn, SN: VNB0306793 for surge testing	TW	---
	0815	Begin Surge Immunity. Mains: +/- 2kV CM, +/- 2kV DM, (0, 90, 180, 270) 120 VAC / 60 Hz (4.1.2.7)	TW	---
	1430	Completed 4-5 testing	TW	Pass

National Technical Systems												
Surge Immunity per IEC / EN 61000-4-5												
Standard Referenced:		VVSG 2005				Date: 10/19/2022						
Temperature:		21°C		Humidity: 29%		Pressure: 832 mb						
Input Voltage:		110Vac/60Hz via UPS										
Configuration of Unit:		Printing mode every 4 minutes (Configuration #1)										
Test Engineer:		T. Wittig										
Voltage (kV)	Polarity +/-	L1	L2	L3	N	PE	Phase (deg)	Number of Pulses	Delay (sec)	Comments	Criteria Met	Pass/Fail
0.5	±	X			X		0	5	30	Differential Mode	A	Pass
0.5	±	X			X		90	5	30		A	Pass
0.5	±	X			X		180	5	30		A	Pass
0.5	±	X			X		270	5	30		A	Pass
0.5	±	X				X	0	5	30	Common Mode Line	A	Pass
0.5	±	X				X	90	5	30		A	Pass
0.5	±	X				X	180	5	30		A	Pass
0.5	±	X				X	270	5	30		A	Pass
0.5	±				X	X	0	5	45	Common Mode Neutral	A	Pass
0.5	±				X	X	90	5	45		A	Pass
0.5	±				X	X	180	5	45		A	Pass
0.5	±				X	X	270	5	45		A	Pass
1.0	±	X			X		0	5	60	Differential Mode	A	Pass
1.0	±	X			X		90	5	60		A	Pass
1.0	±	X			X		180	5	60		A	Pass
1.0	±	X			X		270	5	60		A	Pass
1.0	±	X				X	0	5	60	Common Mode Line	A	Pass
1.0	±	X				X	90	5	60		A	Pass
1.0	±	X				X	180	5	60		A	Pass
1.0	±	X				X	270	5	60		A	Pass
1.0	±				X	X	0	5	60	Common Mode Neutral	A	Pass
1.0	±				X	X	90	5	60		A	Pass
1.0	±				X	X	180	5	60		A	Pass
1.0	±				X	X	270	5	60		A	Pass
2.0	±	X			X		0	5	60	Differential Mode	A	Pass
2.0	±	X			X		90	5	60		A	Pass
2.0	±	X			X		180	5	60		A	Pass
2.0	±	X			X		270	5	60		A	Pass
2.0	±	X				X	0	5	60	Common Mode Line	A	Pass
2.0	±	X				X	90	5	60		A	Pass
2.0	±	X				X	180	5	60		A	Pass
2.0	±	X				X	270	5	60		A	Pass
2.0	±				X	X	0	5	60	Common Mode Neutral	A	Pass
2.0	±				X	X	90	5	60		A	Pass
2.0	±				X	X	180	5	60		A	Pass
2.0	±				X	X	270	5	60		A	Pass

5.10.4 Test Photographs

EN 61000-4-5 Setup Photo



5.10.5 Test Equipment List

Table 5.10-1: Surge Immunity Test Equipment List

Asset Number	Asset Type	Manufacturer	Model	Calibrated	Due
WC059918	Ground Plane (Fixed)	NTS Labs, LLC	GP #2	NCR	NCR
WC059669	Meter (Digital Multimeter)	Fluke	83-3	09/12/2022	09/12/2023
WC059683	Oscilloscope (Digital)	Tektronix	TDS2002B	08/02/2022	08/02/2023
WC059768	Generator (Spike/Transient)	Thermo Fisher Scientific	EMC Pro Plus	11/09/2021	11/09/2022
WC070508	Software	Keytek	CEWare	NCR	NCR
WC078488	Meter (Hydrometer)	Extech Instruments	Datalogger 42270	06/14/2021	01/19/2023

Calibration Abbreviations

CAL: Calibration

NCR: No Calibration Required



5.11 Electrostatic Discharge

5.11.1 Test Procedure

EN 61000-4-2

5.11.2 Test Result

Passed

5.11.3 Test Datasheets

National Technical Systems				
Electrostatic Discharge per IEC / EN 61000-4-2				
Standard Referenced: <u>VVSG 2005</u>		Date: <u>10/21/2022</u>		
Temperature: <u>20.6C</u> Humidity: <u>31%</u>		Pressure: <u>842 mb</u>		
Input Voltage: <u>110Vac/60Hz via UPS</u>				
Configuration of Unit: <u>Printing mode (Configuration #1)</u>				
Test Engineer: <u>Casey Lockhart</u>				
Date	Time	Log Entries	Initials	Result
10/21/22	0900	Performed ESD pre-test verification	CL	Pass
		Setup 4-2 testing on the M404dn	CL	Pass
		Electrostatic Discharge. +/- 8kV Contact, +/-2, 4, 8, 15kV Air. 120 VAC / 60 Hz (4.1.2.8)	CL	Pass
		Bleed-off cables: (Ohms) .936 & .938	CL	Pass
10/21/22		Client justification for not testing the rear of the EUT - The HP printers both models 4001 and M404 are situated within a cart to remove access to the power plugs. The units are only exposed to the front, top, and a portion of the sides. Based on this we are requesting the back of the printer not be exposed to ESD, with only the front, top, sides, and paper tray under test. Our customer understands this will be notated within the report and wanted to provide this request to you for coverage.	ED	NA

National Technical Systems	
Electrostatic Discharge per IEC / EN 61000-4-2	
Standard Referenced: VVSG 2005	Date: 10/21/2022
Temperature: 20.6C Humidity: 31%	Pressure: 842 mb
Input Voltage: 110Vac/60Hz via UPS	
Configuration of Unit: Printing mode (Configuration #1)	
Test Engineer: Casey Lockhart	

Test Location	Voltage Level	Polarity		Number of Pulses	Pulses Per Second	Comments	Criteria Met	Pass/Fail
	(kV)	+	-					
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	A	Pass
Contact Discharge Points - RED Arrows.								
Front	8	X	X	10	1	ND	---	---
Right	8	X	X	10	1	ND	---	---
Back	8	X	X	10	1	Not tested	---	---
Left	8	X	X	10	1	ND	---	---
Air Discharge Points - BLUE Arrows.								
Front	2,4,8,15	X	X	10	1	ND	A	Pass
Right	2,4,8,15	X	X	10	1	ND	---	---
Back	2,4,8,15	X	X	10	1	Not tested	---	---
Left	2,4,8,15	X	X	10	1	ND	---	---
ND: No Discharge points found								

5.11.4 Test Photographs



EN 61000-4-2 Setup Config 1



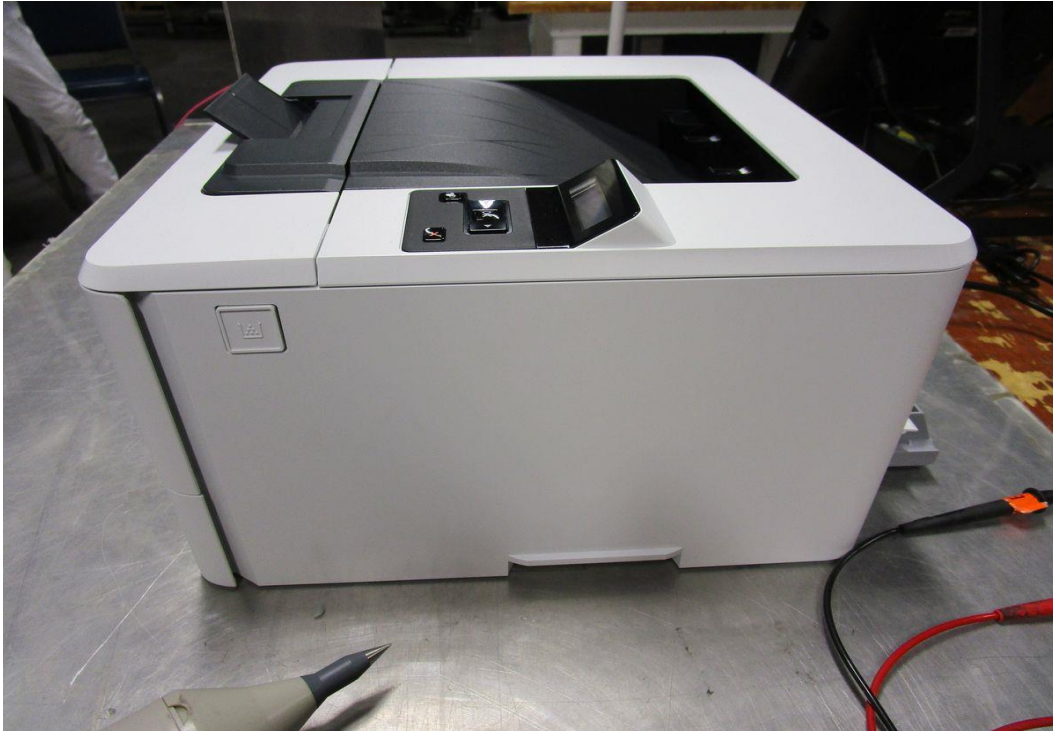
EN 61000-4-2 Front Config 1



EN 61000-4-2 Left Config 1



EN 61000-4-2 Back Config 1



EN 61000-4-2 Right Config 1



5.11.5 Test Equipment List

Table 5.11-1: Electrostatic Discharge Test Equipment List

Asset Number	Asset Type	Manufacturer	Model	Calibrated	Due
WC059918	Ground Plane (Fixed)	NTS Labs, LLC	GP #2	NCR	NCR
WC059665	Gun (ESD Simulator)	EMC-Partner	ESD3000	05/31/2022	05/31/2023
WC059692	Meter (Digital Multimeter)	Fluke	83-3	09/12/2022	09/12/2023
WC078489	Meter (Hydrometer)	Extech Instruments	Datalogger 42270	05/22/2022	05/22/2023

Calibration Abbreviations

CAL: Calibration

NCR: No Calibration Required



5.12 Electrostatic Discharge

5.12.1 Test Procedure

EN 61000-4-2

5.12.2 Test Result

Passed

5.12.3 Test Datasheets

National Technical Systems				
Electrostatic Discharge per IEC / EN 61000-4-2				
Standard Referenced: <u>VVSG 2005</u>		Date: <u>10/21/2022</u>		
Temperature: <u>20.9C</u>	Humidity: <u>33%</u>	Pressure: <u>842 mb</u>		
Input Voltage: <u>110Vac/60Hz via UPS</u>				
Configuration of Unit: <u>Printing mode (Configuration #2)</u>				
Test Engineer: <u>Casey Lockhart</u>				
Date	Time	Log Entries	Initials	Result
10/21/22	1000	Performed ESD pre-test verification	CL	Pass
		Setup 4-2 testing on the 4001dn, SN:	CL	Pass
		Electrostatic Discharge. +/- 8kV Contact, +/-2, 4, 8, 15kV Air. 120 VAC / 60 Hz (4.1.2.8)	CL	Pass
		Bleed-off cables: (Ohms) .936 & .938	CL	Pass
10/21/22		Client justification for not testing the rear of the EUT - The HP printers both models 4001 and M404 are situated within a cart to remove access to the power plugs. The units are only exposed to the front, top, and a portion of the sides. Based on this we are requesting the back of the printer not be exposed to ESD, with only the front, top, sides, and paper tray under test. Our customer understands this will be notated within the report and wanted to provide this request to you for coverage.	ED	NA



National Technical Systems	
Electrostatic Discharge per IEC / EN 61000-4-2	
Standard Referenced: VVSG 2005	Date: 10/21/2022
Temperature: 20.9C Humidity: 33%	Pressure: 842 mb
Input Voltage: 110Vac/60Hz via UPS	
Configuration of Unit: Printing mode (Configuration #2)	
Test Engineer: Casey Lockhart	

Test Location	Voltage Level	Polarity		Number of Pulses	Pulses Per Second	Comments	Criteria Met	Pass/Fail
	(kV)	+	-					
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	A	Pass
Contact Discharge Points - RED Arrows.								
Front	8	X	X	10	1	ND	---	---
Right	8	X	X	10	1	ND	---	---
Back	8	X	X	10	1	Not tested	---	---
Left	8	X	X	10	1	ND	---	---
Air Discharge Points - BLUE Arrows.								
Front	2,4,8,15	X	X	10	1		A	Pass
Right	2,4,8,15	X	X	10	1	ND	---	---
Back	2,4,8,15	X	X	10	1	Not tested	---	---
Left	2,4,8,15	X	X	10	1	ND	---	---
ND: No Discharge points found								

5.12.4 Test Photographs



EN 61000-4-2 Setup Config 2



EN 61000-4-2 Back Config 2



EN 61000-4-2 Front Config 2



EN 61000-4-2 Left Config 2



EN 61000-4-2 Right Config 2



5.12.5 Test Equipment List

Table 5.12-1: Electrostatic Discharge Test Equipment List

Asset Number	Asset Type	Manufacturer	Model	Calibrated	Due
WC059918	Ground Plane (Fixed)	NTS Labs, LLC	GP #2	NCR	NCR
WC059665	Gun (ESD Simulator)	EMC-Partner	ESD3000	05/31/2022	05/31/2023
WC059692	Meter (Digital Multimeter)	Fluke	83-3	09/12/2022	09/12/2023
WC078489	Meter (Hydrometer)	Extech Instruments	Datalogger 42270	05/22/2022	05/22/2023

Calibration Abbreviations

CAL: Calibration

NCR: No Calibration Required



5.13 Power Frequency H-Field Immunity

5.13.1 Test Procedure

EN 61000-4-8 (VVSG 2005)

5.13.2 Test Result

Passed

5.13.3 Test Datasheets

National Technical Systems				
Power Frequency H-field Immunity per IEC / EN61000-4-8				
Standard Referenced: VVSG 2005		Date: 10/21/2022		
Temperature: 22°C	Humidity: 24%%	Pressure: 833mb		
Input Voltage: 110vac/60Hz via UPS				
Configuration of Unit: Pring mode every 5 seconds (Configuration #1)				
Test Engineer: T. Wittig				
Date	Time	Log Entries	Initials	Result
	745	Performed 4-8 pre-test verification	TW	---
		Setup the 4001dn, SN: VNB0305058	TW	---
	1030	Begin Power Frequency H-Field Immunity, 30A/m, 50 / 60 Hz, 3 axes. 120 VAC / 60 Hz (4.1.2.12)	TW	---

National Technical Systems							
Power Frequency H-field Immunity per IEC / EN61000-4-8							
Standard Referenced: VVSG 2005				Date: 10/21/2022			
Temperature: 22°C		Humidity: 24%%		Pressure: 833mb			
Input Voltage: 110vac/60Hz via UPS				Ambient Field: Pass			
Configuration of Unit: Pring mode every 5 seconds (Configuration #1)							
Test Engineer: T. Wittig							
Frequency (Hz)		Field Strength	EUT Location	Dwell Time	Comments	Criteria Met	Pass/Fail
50	60	(A/m)	(Axis)	(sec)			
X		30	X	60		A	Pass
	X	30	X	60		A	Pass
X		30	Y	60		A	Pass
	X	30	Y	60		A	Pass
X		30	Z	60		A	Pass
	X	30	Z	60		A	Pass

5.13.4 Test Photographs

4-8 Setup Photo X



4-8 Setup Photo Y



4-8 Setup Photo Z



5.13.5 Test Equipment List

Table 5.13-1: Power Frequency H-Field Immunity Test Equipment List

Asset Number	Asset Type	Manufacturer	Model	Calibrated	Due
WC059918	Ground Plane (Fixed)	NTS Labs, LLC	GP #2	NCR	NCR
WC059680	Power Supply (AC)	California Instruments	1251P	NCR	NCR
WC059683	Oscilloscope (Digital)	Tektronix	TDS2002B	08/02/2022	08/02/2023
WC059692	Meter (Digital Multimeter)	Fluke	83-3	09/12/2022	09/12/2023
WC070286	Antenna (Loop)	EMC Integrity	EMCI-4-8-2m-1.5m	12/13/2018	NCR
WC078488	Meter (Hydrometer)	Extech Instruments	Datalogger 42270	06/14/2021	01/19/2023

Calibration Abbreviations

CAL: Calibration

NCR: No Calibration Required

5.14 Power Frequency H-Field Immunity

5.14.1 Test Procedure

EN 61000-4-8 (VVSG 2005)

5.14.2 Test Result

Passed

5.14.3 Test Datasheets

National Technical Systems				
Power Frequency H-field Immunity per IEC / EN61000-4-8				
Standard Referenced: <u>VVSG 2005</u>		Date: <u>10/21/2022</u>		
Temperature: <u>22°C</u>		Humidity: <u>24%%</u>		Pressure: <u>833mb</u>
Input Voltage: <u>110vac/60Hz via UPS</u>				
Configuration of Unit: <u>Pring mode every 15 seconds (Configuration #2)</u>				
Test Engineer: <u>T. Wittig</u>				
Date	Time	Log Entries	Initials	Result
10/21/2022	930	Performed 4-8 pre-test verification	TW	---
	940	Setup the 4001 dn, SN: VNB0305058	TW	---
	945	Begin Power Frequency H-Field Immunity, 30A/m, 50 / 60 Hz, 3 axes. 120 VAC / 60 Hz (4.1.2.12)	TW	---
	1015	Completed 4-8 testing	TW	Pass

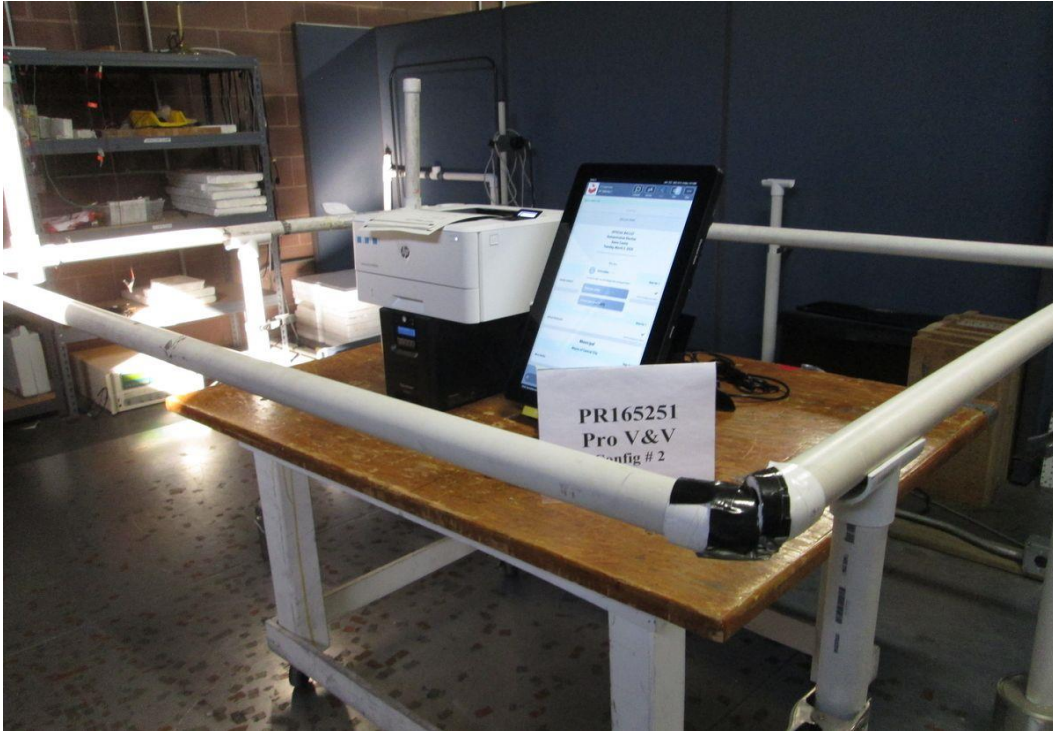
National Technical Systems							
Power Frequency H-field Immunity per IEC / EN61000-4-8							
Standard Referenced: <u>VVSG 2005</u>				Date: <u>10/21/2022</u>			
Temperature: <u>22°C</u>		Humidity: <u>24%%</u>		Pressure: <u>833mb</u>			
Input Voltage: <u>110vac/60Hz via UPS</u>				Ambient Field: <u>Pass</u>			
Configuration of Unit: <u>Pring mode every 15 seconds (Configuration #2)</u>							
Test Engineer: <u>T. Wittig</u>							
Frequency (Hz)		Field Strength	EUT Location	Dwell Time	Comments	Criteria Met	Pass/Fail
50	60	(A/m)	(Axis)	(sec)			
X		30	1	60	X	A	Pass
	X	30	1	60		A	Pass
X		30	2	60	Y	A	Pass
	X	30	2	60		A	Pass
X		30	3	60	Z	A	Pass
	X	30	3	60		A	Pass

5.14.4 Test Photographs

4-8 Setup Photo X



4-8 Setup Photo Y



4-8 Setup Photo Z



5.14.5 Test Equipment List

Table 5.14-1: Power Frequency H-Field Immunity Test Equipment List

Asset Number	Asset Type	Manufacturer	Model	Calibrated	Due
WC059918	Ground Plane (Fixed)	NTS Labs, LLC	GP #2	NCR	NCR
WC059680	Power Supply (AC)	California Instruments	1251P	NCR	NCR
WC059683	Oscilloscope (Digital)	Tektronix	TDS2002B	08/02/2022	08/02/2023
WC059685	Monitor (Current)	Pearson Electronics	110A	07/14/2022	07/14/2023
WC059692	Meter (Digital Multimeter)	Fluke	83-3	09/12/2022	09/12/2023
WC070286	Antenna (Loop)	EMC Integrity	EMCI-4-8-2m-1.5m	12/13/2018	NCR
WC078488	Meter (Hydrometer)	Extech Instruments	Datalogger 42270	06/14/2021	01/19/2023

Calibration Abbreviations

CAL: Calibration

NCR: No Calibration Required



End of Test Report