

FCC PART 15, SUBPART B and C TEST REPORT

for

SDABG1

MODEL: WL430220

Prepared for

DATAMAX / O'NEIL 8 MASON IRVINE, CALIFORNIA 92618-2705

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DATE: MARCH 9, 2010

	REPORT	APPENDICES				TOTAL	
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GENERAL REPORT SUMMARY

This electromagnetic emission test report is generated by Compatible Electronics Inc., which is an independent testing and consulting firm. The test report is based on testing performed by Compatible Electronics personnel according to the measurement procedures described in the test specifications given below and in the "Test Procedures" section of this report.

The measurement data and conclusions appearing herein relate only to the sample tested and this report may not be reproduced without the written permission of Compatible Electronics, unless done so in full.

This report must not be used to claim product endorsement by NVLAP, NIST, or any other agency of the U.S. Government.

Device Tested:	SDABG1 Model: WL430220 S/N: N/A
Product Description:	See Expository Statement.
Modifications:	The EUT was not modified during the testing.
Manufacturer:	Datamax / O'Neil 8 Mason Irvine, California 92618-2705
Test Dates:	February 11, 12, 15, 16, 17, 18, 19, 22, 23, 24, 25, and 26; March 1, 2, 3, 8, and 10, 2010
Test Specifications:	EMI requirements Limits: CFR Title 47, Part 15, Subpart B; and Subpart C, sections 15.205, 15.207, 15.209, and 15.247
Test Procedure:	ANSI C63.4
Test Deviations:	The test procedure was not deviated from during the testing.



TEST	DESCRIPTION	RESULTS		
1	Conducted RF Emissions, 150 kHz – 30 MHz	Complies with the Class B limits of CFR Title 47, Part 15 Subpart B; and the limits of CFR Title 47, Part 15, Subpart C, section 15.207 Highest reading in relation to spec limit: 50.66 dBuV @ 0.194 MHz (*U = 1.68 dB)		
2	Spurious Radiated RF Emissions, 10 kHz – 40 GHz	Complies with the Class B limits of CFR Title 47, Part 15, Subpart B; and CFR Title 47, Part 15, Subpart C, section 15.247(d) Highest reading in relation to spec limit: 40.69 dBuV @ 896.084 MHz (*U = 5.13 dB)		
3	Fundamental and Emissions produced by the intentional radiator in non-restricted bands, 10 kHz – 40 GHz	Complies with the relevant requirements of CFR Title 47, Part 15, Subpart C, section 15.247(d)		
4	Emissions produced by the intentional radiator in restricted bands, 10 kHz – 40 GHz	Complies with the relevant requirements of CFR Title 47, Part 15, Subpart C, section 15.205, 15.209(a), and section 15.247 (d)		
5	6 dB Bandwidth	Complies with the relevant requirements of CFR Title 47, Part 15, Subpart C, section 15.247(a)(2)		
6	Peak Power Output	Complies with the relevant requirements of CFR Title 47, Part 15, Subpart C, section 15.247(b)(3)		
7	RF Conducted Antenna Test	Complies with the relevant requirements of CFR Title 47, Part 15, Subpart C, section 15.247(d)		
8	Peak Power Spectral Density Conducted from the Intentional Radiator to the Antenna	Complies with the relevant requirements of CFR Title 47, Part 15, Subpart C, section 15.247 (e)		

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1. PURPOSE

This document is a qualification test report based on the Electromagnetic Interference (EMI) tests performed on the SDABG1 Model: WL430220. The EMI measurements were performed according to the measurement procedure described in ANSI C63.4. The tests were performed in order to determine whether the electromagnetic emissions from the equipment under test, referred to as EUT hereafter, are within the specification limits defined by CFR Title 47, Part 15, Subpart B; and Subpart C, sections 15.205, 15.207, 15.209, and 15.247.



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2. ADMINISTRATIVE DATA

2.1 Location of Testing

The EMI tests of the testing described herein were performed at the test facility of Compatible Electronics at 114 Olinda Drive, Brea, California 92823.

2.2 Traceability Statement

The calibration certificates of all test equipment used during the test are on file at the location of the test. The calibration is traceable to the National Institute of Standards and Technology (NIST).

2.3 Cognizant Personnel

Datamax / O'Neil

Jonathan Mack

Electrical Design Engineer

Compatible Electronics, Inc.

Kyle Fujimoto	Test Engineer
James Ross	Test Engineer
Alex Benitez	Test Technician

2.4 Date Test Sample was Received

The test sample was received prior to the first date of testing.

2.5 Disposition of the Test Sample

The sample was returned to Datamax / O'Neil on March 16, 2010.

2.6 Abbreviations and Acronyms

The following abbreviations and acronyms may be used in this document.

RF	Radio Frequency
EMI	Electromagnetic Interference
EUT	Equipment Under Test
P/N	Part Number
S/N	Serial Number
HP	Hewlett Packard
ITE	Information Technology Equipment
CML	Corrected Meter Limit
LISN	Line Impedance Stabilization Network
NCR	No Calibration Required
N/A	Not Available
Tx	Transmitter
Rx	Receive or Receiver

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The following documents are referenced or used in the preparation of this EMI Test Report.

SPEC	TITLE
FCC Title 47, Part 15 Subpart C	FCC Rules - Radio frequency devices (including digital devices) – Intentional Radiators
ANSI C63.4 2003	American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz
FCC Title 47, Part 15 Subpart B	FCC Rules - Radio frequency devices (including digital devices) – Unintentional Radiators

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4.1 Description of Test Configuration - EMI

Setup and operation of the equipment under test.

Specifics of the EUT and Peripherals Tested

The EUT was installed inside the printer. The printer was also connected to an AC Adapter via its power port.

The EUT was controlled by a program on the laptop that locked one channel at a time so that the low, middle, and high channels could be tested. This program also allowed the EUT to either be in transmit or receive mode.

Note: A 2-meter unshielded cable was connected between the printer and laptop when the EUT was being programmed (i.e. to change channels). This cable was removed during the actual testing.

Note #2: The EUT was installed in a total of five printers. The printers that the EUT will be used with are the LP3-L, MF2t-L, MF4t-L, OC2, and OC3.

Note #3: The 2412 MHz to 2462 MHz for both 802.11 b and 802.11 g will be for all five printers. The 5745 MHz to 5825 MHz band for 802.11 will only be for the LP3-L printer.

The final radiated as well as the conducted data was taken in the mode above for each printer. Please see Appendix E for the data sheets.

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4.1.1 Cable Construction and Termination

- Cable 1This is a 2 meter unshielded cable connecting the O'Neil Product Development Printer to the AC
Adapter. The cable has a 1/8 inch power connector at the O'Neil Product Development Printer end
and is hard wired into the AC Adapter. The cable was bundled to a length of 1 meter.
- Cable 2(Only Connected when changing the channel on the EUT)
This is a 2-meter unshielded cable connecting the printer to the laptop. The cable has an RJ-45
connector at the printer end and a D-9 pin metallic connector at the laptop end.



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5. LISTS OF EUT, ACCESSORIES AND TEST EQUIPMENT

5.1 EUT and Accessory List

EQUIPMENT	MANUFACTURER	MODEL NUMBER	SERIAL NUMBER	FCC ID
SDABG1 (EUT)	DATAMAX / O'NEIL	WL430220	N/A	LGYWL430220
AC ADAPTER FOR EUT	FAIRWAY ELECTRONICS COMPANY LIMITED	VEG20C-120F	N/A	N/A
LAPTOP	DELL	PP11L	CN0D4571-48643- 589-0382	DoC
AC ADAPTER FOR LAPTOP	DELL	ADP-65JB B	CN-0F8834-48661- 56A-2ROA	N/A
ANTENNA FOR EUT	DATAMAX / O'NEIL	ANTENNA_LEG- B	N/A	N/A
ANTENNA FOR EUT	DATAMAX / O'NEIL	ANTENNA_LEG- B	N/A	N/A
ANTENNA FOR EUT	DATAMAX / O'NEIL	ANTENNA_LEG- B	N/A	N/A
ANTENNA FOR EUT	DATAMAX / O'NEIL	ANTENNA_LEG- B	N/A	N/A
ANTENNA FOR EUT	DATAMAX / O'NEIL	ANTENNA_LEG- B	N/A	N/A
THERMAL PRINTER	DATAMAX / O'NEIL	OC2	N/A	DoC
THERMAL PRINTER	DATAMAX / O'NEIL	OC3	N/A	DoC
THERMAL PRINTER	DATAMAX / O'NEIL	LP3-L	N/A	DoC
THERMAL PRINTER	DATAMAX / O'NEIL	MF2t-L	N/A	DoC
THERMAL PRINTER	DATAMAX / O'NEIL	MF4t-L	N/A	DoC



5.2 EMI Test Equipment for Brea Facility – Part 1

EQUIPMENT TYPE	MANU- FACTURER	MODEL NUMBER	SERIAL NUMBER	CALIBRATION DATE	CALIBRATION DUE DATE		
GENERAL TEST EQUIPMENT USED FOR ALL RF EMISSIONS TESTS							
Computer	Hewlett Packard	4530	US91912319	N/A	N/A		
EMI Receiver	Rohde & Schwarz	ESIB40	100194	September 17, 2008	Sept. 17, 2010		
Spectrum Analyzer – Main Section	Hewlett Packard	8566B	3638A08784	May 29, 2009	May 29, 2010		
Spectrum Analyzer – Display Section	Hewlett Packard	85662A	2648A14530	May 29, 2009	May 29, 2010		
Quasi-Peak Adapter	Hewlett Packard	85650A	2430A00424	May 29, 2009	May 29, 2010		
Monitor	Hewlett Packard	D5258A	TW74500641	N/A	N/A		
	RF RA	DIATED EMISS	IONS TEST EQ	UIPMENT			
CombiLog Antenna	Com Power	AC-220	61027	June 12, 2009	June 12, 2010		
Preamplifier	Com-Power	PA-103	1582	January 6, 2010	January 6, 2011		
Loop Antenna	Com-Power	AL-130	17089	September 29, 2008	Sept. 29, 2010		
Horn Antenna	Com-Power	AH-118	071175	June 27, 2008	June 27, 2010		
Microwave Preamplifier	Com-Power	PA-122	181921	March 12, 2009	March 12, 2010		
Microwave Preamplifier	Com-Power	PA-840	711013	March 12, 2009	March 12, 2010		
Horn Antenna	Antenna Research	MWH-2640/B	1011	NCR	NCR		
Horn Antenna	Com-Power	AH826	71957	NCR	NCR		
Antenna Mast	Com Power	AM-100	N/A	N/A	N/A		
RF CONDUCTED EMISSIONS TEST EQUIPMENT							
Emissions Program	Compatible Electronics	2.3 (SR19)	N/A	N/A	N/A		
LISN	Com Power	LI-215	12076	September 28, 2009	Sept. 28, 2010		
LISN	Com Power	LI-215	12090	September 28, 2009	Sept. 28, 2010		
Transient Limiter	Com Power	252A910	1	September 28, 2009	Sept. 28, 2010		

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5.3 EMI Test Equipment for Brea Facility – Part 2

EQUIPMENT TYPE	MANU- FACTURER	MODEL NUMBER	SERIAL NUMBER	CALIBRATION DATE	CALIBRATION DUE DATE	
RF POWER OUPUT TEST EQUIPMENT						
Power Measuring Analyzer	Boonton Electronics	4500A-01	1282	June 20, 2008	June 20, 2010	
Peak Power Sensor	Boonton Electronics	57318	3723	June 25, 2008	June 25, 2010	

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6.1 Test Facility Description

Please refer to section 2.1 and 7.1 of this report for EMI test location.

6.2 EUT Mounting, Bonding and Grounding

The EUT was mounted on a 1.0 by 1.5 meter non-conductive table 0.8 meters above the ground plane.

The EUT was not grounded.

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7.1 Antenna Gain

The antenna LEG-B has a gain of 3 dBi The antenna LEG-C2 has a gain of 2.4 dBi The antenna LEG-E has a gain of 0 dBi



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8. TEST PROCEDURES

The following sections describe the test methods and the specifications for the tests. Test results are also included in this section.

8.1 **RF Emissions**

8.1.1 Conducted Emissions Test

The EMI Receiver was used as a measuring meter. The data was collected with the spectrum analyzer in the peak detect mode with the "Max Hold" feature activated. The quasi-peak was used only where indicated in the data sheets. A transient limiter was used for the protection of the spectrum analyzer input stage, and the offset was adjusted accordingly to read the actual data measured. The LISN output was measured using the EMI Receiver. The output of the second LISN was terminated by a 50 ohm termination. The effective measurement bandwidth used for this test was 9 kHz.

Please see section 6.2 of this report for mounting, bonding and grounding of the EUT. The EUT was powered through the LISN, which was bonded to the ground plane. The LISN power was filtered and the filter was bonded to the ground plane. The EUT was set up with the minimum distances from any conductive surfaces as specified in ANSI C63.4. The excess power cord was wrapped in a figure eight pattern to form a bundle not exceeding 0.4 meters in length.

The conducted emissions from the EUT were maximized for operating mode as well as cable placement. The final data was collected under program control by the Compatible Electronics conducted emissions software in several overlapping sweeps by running the EMI Receiver at a minimum scan rate of 10 seconds per octave. The final qualification data is located in Appendix E.

Test Results:

The EUT complies with the **Class B** limits of CFR Title 47, Part 15 Subpart B; and the limits of CFR Title 47, Part 15, Subpart C, Section 15.207 for conducted emissions.

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8.1.2 Radiated Emissions (Spurious and Harmonics) Test

The spectrum analyzer and EMI Receiver were used as a measuring meter along with the quasi-peak adapter. Amplifiers were used to increase the sensitivity of the instrument. The Com Power Preamplifiers Model: PA-102 and PA-103 were used for frequencies from 30 MHz to 1 GHz, the Com-Power Microwave Preamplifier Model: PA-122 was used for frequencies from 1 GHz to 18 GHz, and the Com Power Microwave Preamplifier Model: PA-840 was used for frequencies from 18 GHz to 25 GHz. The spectrum analyzer and EMI Receiver were used in the peak detect mode with the "Max Hold" feature activated. In this mode, the spectrum analyzer and/or EMI Receiver records the highest measured reading over all the sweeps.

The quasi-peak adapter was used only for those readings which are marked accordingly on the data sheets.

The frequencies above 1 GHz were averaged manually by narrowing the video filter down to 10 Hz and putting the sweep time on AUTO on the spectrum analyzer to keep the amplitude reading calibrated.

The measurement bandwidths and transducers used for the radiated emissions test were
--

FREQUENCY RANGE	EFFECTIVE MEASUREMENT BANDWIDTH	TRANSDUCER
10 kHz to 150 kHz	200 Hz	Active Loop Antenna
	200 112	
150 kHz to 30 MHz	9 kHz	Active Loop Antenna
30 MHz to 300 MHz	120 kHz	Biconical Antenna
300 MHz to 1 GHz	120 kHz	Log Periodic Antenna
1 GHz to 40 GHz	1 MHz	Horn Antenna

The open field test site of Compatible Electronics, Inc. was used for radiated emission testing. This test site is set up according to ANSI C63.4. Please see section 6.2 of this report for mounting, bonding and grounding of the EUT. The turntable supporting the EUT is remote controlled using a motor. The turntable permits EUT rotation of 360 degrees in order to maximize emissions. Also, the antenna mast allows height variation of the antenna from 1 meter to 4 meters. Data was collected in the worst case (highest emission) configuration of the EUT by the Radiated Emission Manual Test software. At each reading, the EUT was rotated 360 degrees and the antenna height was varied from 1 to 4 meters (for E field radiated field strength). The gunsight method was used when measuring with the horn antenna in order to ensure accurate results.

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Radiated Emissions (Spurious and Harmonics) Test (con't)

The presence of ambient signals was verified by turning the EUT off. In case an ambient signal was detected, the measurement bandwidth was reduced temporarily and verification was made that an additional adjacent peak did not exist. This ensures that the ambient signal does not hide any emissions from the EUT. The EUT was tested at a 3 meter test distance to obtain the final data.

Test Results:

The EUT complies with the **Class B** limits of CFR Title 47, Part 15, Subpart B; and Subpart C, sections 15.205, 15.209, and 15.247 (d). Please see the data sheets located in Appendix E.



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8.2 6 dB Bandwidth

The 6 dB bandwidth was measured using the EMI Receiver. The bandwidth was measured using a direct connection from the RF out on the EUT. The resolution bandwidth was 100 kHz and the video bandwidth was 300 kHz.

Test Results:

This test complies with the relevant requirements of CFR Title 47, Part 15, Subpart C section 15.247 (a)(2).

8.3 Peak Output Power

The Peak Output Power was taken using the power meter and power sensor. The EUT was directly connected to the power sensor, which was directly connected to the power meter. The Peak Output Power was then taken.

Test Results:

This test complies with the relevant requirements of CFR Title 47, Part 15, Subpart C section 15.247 (b)(3).

8.4 RF Antenna Conducted Test

The RF antenna conducted test was taken using the EMI Receiver. The RF antenna conducted test was measured using a direct connection from the RF out on the EUT into the input of the analyzer. The resolution bandwidth was 100 kHz, and the video bandwidth 300 kHz. The spans were wide enough to include all the harmonics and emissions that were produced by the intentional radiator.

Test Results:

This test complies with the relevant requirements of CFR Title 47, Part 15, Subpart C section 15.247 (d).



8.5 Spectral Density Output

The spectral density output was measured using the EMI Receiver. The spectral density output was measured using a direct connection from the RF out on the EUT into the input of the EMI Receiver. The resolution bandwidth was 3 kHz, and the video bandwidth was 10 kHz. The highest 1.5 MHz of the signal was used as the frequency span with the sweep rate being 1 second for every 3 kHz of span.

Test Results:

This test complies with the relevant requirements of CFR Title 47, Part 15, Subpart C section 15.247 (e).

8.6 **RF Band Edges**

For the 2400 MHz to 2483.5 MHz band: The RF band edges were taken at the start of the restricted bands (2390 MHz and 2483.5 MHz). The readings taken were also averaged by the EMI Receiver. Data sheets are included in Appendix E, which compares the reading from the EMI Receiver to the spec limit.

For the 5725 MHz to 5850 MHz band: The RF band edges were taken at the edges of the ISM spectrum (5725 MHz when the EUT was on the low channel and 5850 MHz when the EUT was on the high channel) using the EMI Receiver. The RBW was set to 100 kHz and the VBW was set to 300 kHz. Plots of the fundamental were taken to ensure the amplitude at the band edges were at least 20 dB down from the peak of the fundamental emission.

Test Results:

For the 2400 MHz to 2483.5 MHz band: The EUT complies with the relevant requirements of FCC Title 47, Part 15, Subpart C section 15.247 (d). The RF power at the restricted bands closest to the band edges at 2390 MHz and 2483.5 MHz meet the limits of section 15.209. Please see the data sheets located in Appendix E.

For the 5725 MHz to 5850 MHz band: The EUT complies with the relevant requirements of FCC Title 47, Part 15, Subpart C section 15.247 (d). The RF power at the band edges at 5725 MHz and 5850 MHz meet the requirements of FCC Title 47, Part 15, Subpart C section 15.247 (d). Please see the data sheets located in Appendix E.

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9. CONCLUSIONS

The SDABG1 Model: WL430220 meets all of the specification limits defined in FCC Title 47, Part 15, Subpart B; and Subpart C, sections 15.205, 15.209, and 15.247.



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APPENDIX A

LABORATORY RECOGNITIONS

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Compatible Electronics has the following agency accreditations:

National Voluntary Laboratory Accreditation Program - Lab Code: 200528-0

Voluntary Control Council for Interference - Registration Numbers: R-983, C-1026, R-984 and C-1027

Bureau of Standards and Metrology Inspection - Reference Number: SL2-IN-E-1031

Conformity Assessment Body for the EMC Directive Under the US/EU MRA Appointed by NIST

Compatible Electronics is recognized or on file with the following agencies:

Federal Communications Commission

Industry Canada

Radio-Frequency Technologies (Competent Body)

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APPENDIX B

MODIFICATIONS TO THE EUT

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MODIFICATIONS TO THE EUT

The modifications listed below were made to the EUT to pass FCC Subpart B and Subpart C specifications.

All the rework described below was implemented during the test in a method that could be reproduced in all the units by the manufacturer.

No modifications were made to the EUT during the testing.



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APPENDIX C

ADDITIONAL MODELS COVERED UNDER THIS REPORT

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ADDITIONAL MODELS COVERED UNDER THIS REPORT

USED FOR THE PRIMARY TEST

SDABG1 Model: WL430220 S/N: N/A

There were no additional models covered under this report.



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APPENDIX D

DIAGRAMS, CHARTS, AND PHOTOS

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FIGURE 1: CONDUCTED EMISSIONS TEST SETUP



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FIGURE 2: PLOT MAP AND LAYOUT OF 3 METER RADIATED SITE

OPEN LAND > 15 METERS



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FRONT VIEW

DATAMAX / O'NEIL SDABG1 MODEL: WL430220 FCC SUBPART B and C – RADIATED EMISSIONS – LAB B – IN THE LP3-L PRINTER

PHOTOGRAPH SHOWING THE EUT CONFIGURATION FOR MAXIMUM EMISSIONS

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REAR VIEW

DATAMAX / O'NEIL SDABG1 MODEL: WL430220 FCC SUBPART B and C – RADIATED EMISSIONS – LAB B – IN THE LP3-L PRINTER

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FRONT VIEW

DATAMAX / O'NEIL SDABG1 MODEL: WL430220 FCC SUBPART B and C – RADIATED EMISSIONS – LAB A – IN THE LP3-L PRINTER

PHOTOGRAPH SHOWING THE EUT CONFIGURATION FOR MAXIMUM EMISSIONS

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REAR VIEW

DATAMAX / O'NEIL SDABG1 MODEL: WL430220 FCC SUBPART B and C – RADIATED EMISSIONS – LAB A – IN THE LP3-L PRINTER

PHOTOGRAPH SHOWING THE EUT CONFIGURATION FOR MAXIMUM EMISSIONS

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FRONT VIEW

DATAMAX / O'NEIL SDABG1 MODEL: WL430220 FCC SUBPART B and C – RADIATED EMISSIONS – LAB B – IN THE MF2t-L PRINTER

PHOTOGRAPH SHOWING THE EUT CONFIGURATION FOR MAXIMUM EMISSIONS

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REAR VIEW

DATAMAX / O'NEIL SDABG1 MODEL: WL430220 FCC SUBPART B and C – RADIATED EMISSIONS – LAB B – IN THE MF2t-L PRINTER

PHOTOGRAPH SHOWING THE EUT CONFIGURATION FOR MAXIMUM EMISSIONS

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FRONT VIEW

DATAMAX / O'NEIL SDABG1 MODEL: WL430220 FCC SUBPART B and C – RADIATED EMISSIONS – LAB A – IN THE MF2t-L PRINTER

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FRONT VIEW

DATAMAX / O'NEIL SDABG1 MODEL: WL430220 FCC SUBPART B and C – RADIATED EMISSIONS – LAB B – IN THE MF4t-L PRINTER

PHOTOGRAPH SHOWING THE EUT CONFIGURATION FOR MAXIMUM EMISSIONS

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REAR VIEW

DATAMAX / O'NEIL SDABG1 MODEL: WL430220 FCC SUBPART B and C – RADIATED EMISSIONS – LAB B – IN THE MF4t-L PRINTER

PHOTOGRAPH SHOWING THE EUT CONFIGURATION FOR MAXIMUM EMISSIONS

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