



CBORD Group, Inc.
VRC2100 Vending Reader with RFID

Report #: CBOR0004



Report Prepared By Northwest EMC Inc.

NORTHWEST EMC – (888) 364-2378 – www.nwemc.com

California – Minnesota – Oregon – New York – Washington

CERTIFICATE OF TEST

Last Date of Test: May 31, 2012

CBORD Group, Inc.

Model: VRC2100 Vending Reader with RFID

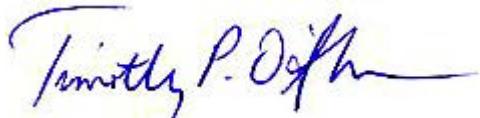
Emissions

Test Description	Specification	Test Method	Pass/Fail
Field Strength of Fundamental	FCC 15.225:2012	ANSI C63.10:2009	Pass
Field Strength of Spurious Emissions	FCC 15.225:2012	ANSI C63.10:2009	Pass
Frequency Stability	FCC 15.225:2012	ANSI C63.10:2009	Pass
AC Powerline Conducted Emissions	FCC 15.207:2012	ANSI C63.10:2009	Pass

Deviations From Test Standards

None

Approved By:



Tim O'Shea, Operations Manager



NVLAP Lab Code: 200676-0

Test Facility

The measurement facility used to collect the data is located at:

Northwest EMC, Inc.
41 Tesla Ave.
Irvine, CA 92618

Phone: (503) 844-4066 Fax: 844-3826

This site has been fully described in a report filed with and accepted by the FCC (Federal Communications Commission) and Industry Canada (Site filing #2834B-1).

This report must not be used to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the federal government of the United States of America.

Product compliance is the responsibility of the client, therefore the tests and equipment modes of operation represented in this report were agreed upon by the client, prior to testing. This Report may only be duplicated in its entirety. The results of this test pertain only to the sample(s) tested. The specific description is noted in each of the individual sections of the test report supporting this certificate of test.

REVISION HISTORY

Revision Number	Description	Date	Page Number
00	None		

United States

FCC - Designated by the FCC as a Telecommunications Certification Body (TCB). Certification chambers, Open Area Test Sites, and conducted measurement facilities are listed with the FCC.

A2LA - Accredited by A2LA to ISO / IEC Guide 65 as a product certifier. This allows Northwest EMC to certify transmitters to FCC and IC specifications.

NVLAP - Each laboratory is accredited by NVLAP to ISO 17025

Canada

IC - Recognized by Industry Canada as a Certification Body (CB). Certification chambers and Open Area Test Sites are filed with IC.

European Union

European Commission – Validated by the European Commission as a Conformity Assessment Body (CAB) under the EMC directive and as a Notified Body under the R&TTE Directive.

Australia/New Zealand

ACMA - Recognized by ACMA as a CAB for the acceptance of test data.

Korea

KCC / RRA - Recognized by KCC's RRA as a CAB for the acceptance of test data.

Japan

VCCI - Associate Member of the VCCI. Conducted and radiated measurement facilities are registered.

Taiwan

BSMI – Recognized by BSMI as a CAB for the acceptance of test data.

NCC - Recognized by NCC as a CAB for the acceptance of test data.

Singapore

IDA – Recognized by IDA as a CAB for the acceptance of test data.

Hong Kong

OFTA – Recognized by OFTA as a CAB for the acceptance of test data.

Vietnam

MIC – Recognized by MIC as a CAB for the acceptance of test data.

Russia

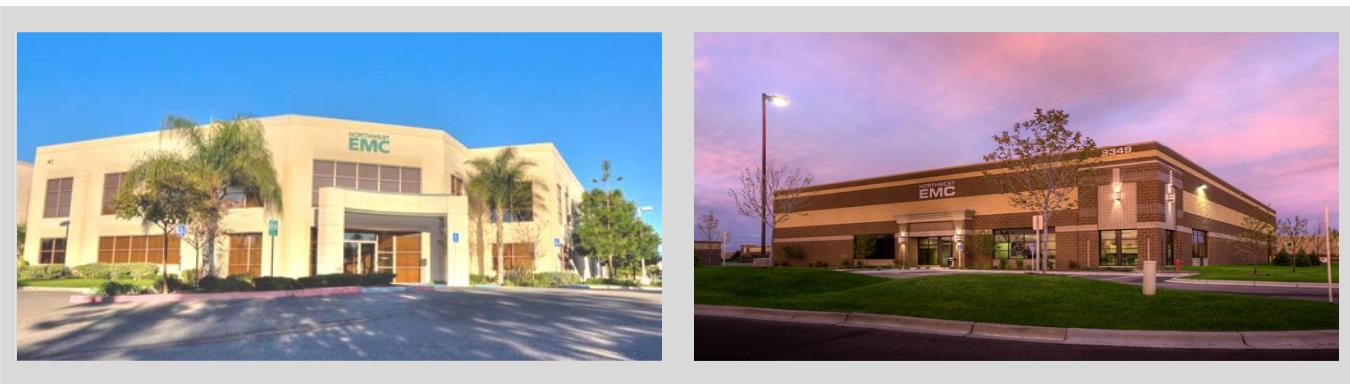
GOST – Accredited by Certinform VNIINMASH, CERTINFO, SAMTES, and Federal CHEC to perform EMC and Hygienic testing for Information Technology products to GOST standards.

SCOPE

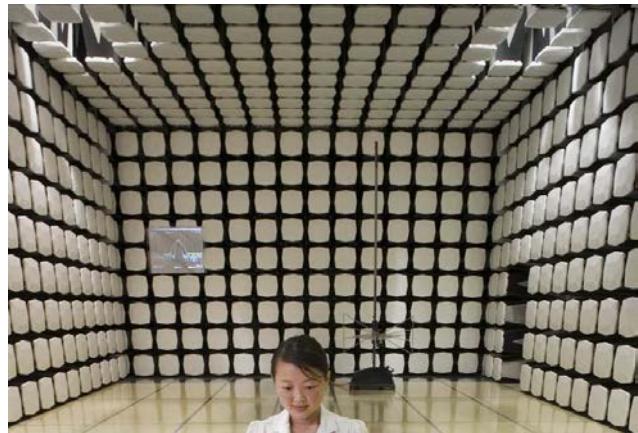
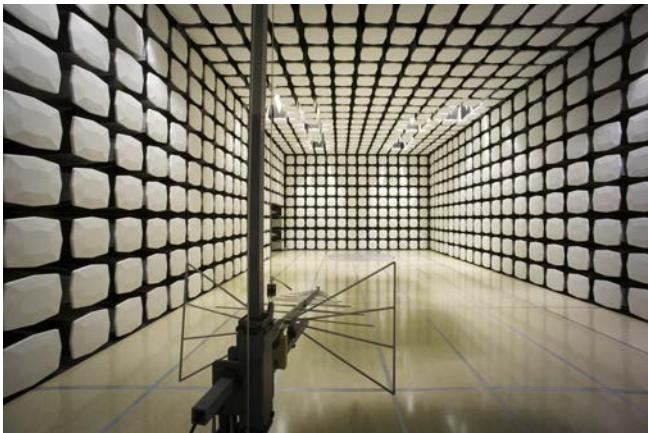
For details on the Scopes of our Accreditations, please visit:

<http://www.nwemc.com/accreditations/>

LOCATIONS



Oregon Labs EV01-EV12 22975 NW Evergreen Pkwy, #400 Hillsboro, OR 97124 (503) 844-4066	California Labs OC01-OC13 41 Tesla Irvine, CA 92618 (949) 861-8918	New York Labs WA01-WA04 4939 Jordan Rd. Elbridge, NY 13060 (315) 685-0796	Minnesota Labs MN01-MN08 9349 W Broadway Ave. Brooklyn Park, MN 55445 (763) 425-2281	Washington Labs SU01-SU07 14128 339 th Ave. SE Sultan, WA 98294 (360) 793-8675
VCCI				
EV01: C-1071, R-1025, G-84 EV07: C-2687, T-1658 EV11: R-2318	OC06: C-2766, T-1659 OC07: G-548 OC08: R-1943, G-85 OC10: A-0029		MN03: C-3464, T-1634 MN04: R-3125 MN05: G-141	SU01: C-3265, T-1511 SU02: R-871, G-83
Industry Canada				
2834D-1, 2834D-2	2834B-1, 2834B-2, 2834B-3		2834E-1	2834C-1





PRODUCT DESCRIPTION

Client and Equipment Under Test (EUT) Information

Company Name:	CBORD Group, Inc.
Address:	6330 Gateway Drive, Suite A
City, State, Zip:	Cypress, CA 90630
Test Requested By:	John Darjany
Model:	VRC2100 Vending Reader with RFID
First Date of Test:	May 30, 2012
Last Date of Test:	May 31, 2012
Receipt Date of Samples:	May 30, 2012
Equipment Design Stage:	Production
Equipment Condition:	No Damage

Information Provided by the Party Requesting the Test

Functional Description of the EUT (Equipment Under Test):

This system had two transmitters which operate at 125 kHz and 13.56 MHz (RFID).

Testing Objective:

RFID radio seeking system approval under FCC 15.225

Configuration 1 CBOR0004

EUT				
Description		Manufacturer	Model/Part Number	Serial Number
Contactless Reader Module and Antenna		CBORD Group, Inc.	OEM100/VRC2100	V0600005

Peripherals in test setup boundary				
Description		Manufacturer	Model/Part Number	Serial Number
Power Supply		Generic	124044	0544
Ethernet Switch		Linksys	EZXS55W, V2	135001527
Ethernet Switch Power Supply		Linksys	MKD-4175700	None

Cables					
Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
DC Cable	No	1.8m	No	EUT	AC Mains
Ethernet Cable	No	2.0m	No	EUT	Ethernet Switch
DC Cable	No	1.8m	No	Ethernet Switch	Ethernet Switch Power Supply

PA = Cable is permanently attached to the device. Shielding and/or presence of ferrite may be unknown.

MODIFICATIONS

Equipment Modifications

Item	Date	Test	Modification	Note	Disposition of EUT
1	5/30/2012	Field Strength of Fundamental	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Northwest EMC following the test.
2	5/30/2012	AC Powerline Conducted Emissions	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Northwest EMC following the test.
3	5/31/2012	Field Strength of Spurious Emissions	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Northwest EMC following the test.
4	5/31/2012	Frequency Stability	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	Scheduled testing was completed.

Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data. The test data represents the configuration / operating mode/ model that produced the highest emission levels as compared to the specification limit.

MODES OF OPERATION

RFID On. Transmitting at 13.56 MHz

POWER SETTINGS INVESTIGATED

24 VDC

CONFIGURATIONS INVESTIGATED

CBOR0004 - 1

FREQUENCY RANGE INVESTIGATED

Start Frequency	9 kHz	Stop Frequency	30 MHz
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SAMPLE CALCULATIONS

Radiated Emissions: Field Strength = Measured Level + Antenna Factor + Cable Factor - Amplifier Gain + Distance Adjustment Factor + External Attenuation

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Interval
OC10 Cables	N/A	10kHz-1GHz RE Cables	OCH	6/24/2011	12 mo
Spectrum Analyzer	Agilent	E4440A	AFG	5/16/2012	12 mo
Antenna, Loop	EMCO	6502	AZB	12/6/2010	24 mo

MEASUREMENT BANDWIDTHS

Frequency Range (MHz)	Peak Data (kHz)	Quasi-Peak Data (kHz)	Average Data (kHz)
0.01 - 0.15	1.0	0.2	0.2
0.15 - 30.0	10.0	9.0	9.0
30.0 - 1000	100.0	120.0	120.0
Above 1000	1000.0	N/A	1000.0

MEASUREMENT UNCERTAINTY

A measurement uncertainty estimation has been performed for each test per our internal quality document WP 342. The estimation is used to compare the measured result with its "true" or theoretically correct value. The expanded measurement uncertainty for radiated emissions measurements is less than +/- 4 dB, and for conducted emissions measurements is less than +/- 2.7 dB. Our measurement data meets or exceeds the measurement uncertainty requirements of CISPR 16-4; therefore, the test data can be compared directly to the specification limit to determine compliance. The calculations for measurement uncertainty are available upon request.

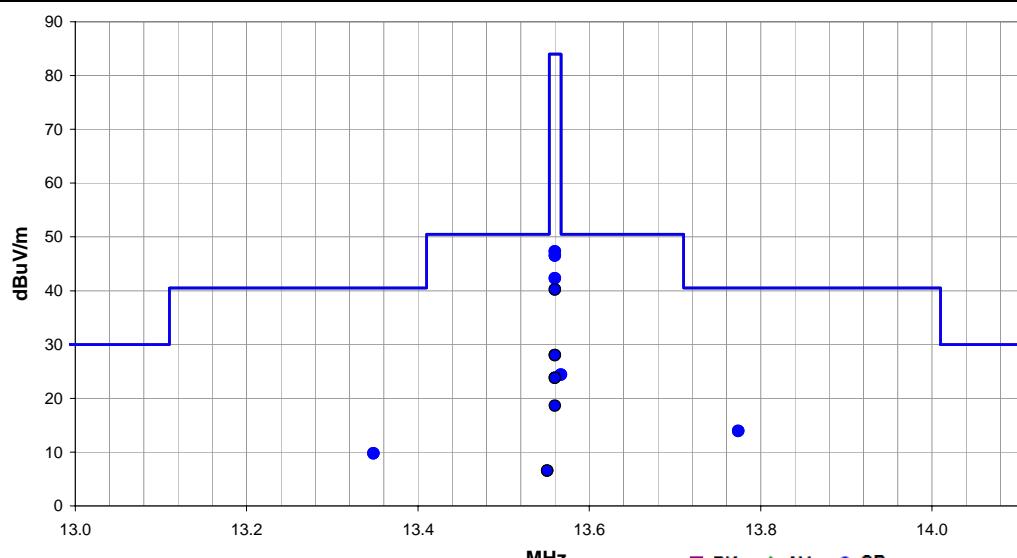
TEST DESCRIPTION

The antennas to be used with the EUT were tested. The EUT was continuously transmitting while set to the channel specified. While scanning, emissions from the EUT were maximized by rotating the EUT, adjusting the measurement antenna height and orientation in 3 orthogonal planes, the EUT and/or associated antenna is positioned in 3 orthogonal planes (per ANSI C63.10). An active loop antenna was used for this test in order to provide sufficient measurement sensitivity.

Work Order:	CBOR0004	Date:	05/30/12	
Project:	None	Temperature:	23.93 °C	
Job Site:	OC10	Humidity:	49.5% RH	
Serial Number:	V0600005	Barometric Pres.:	1017 mbar	Tested by: Jaemi Suh
EUT:	VRC2100 Vending Reader with RFIC			
Configuration:	1			
Customer:	CBORD Group, Inc.			
Attendees:	John Darjany			
EUT Power:	24 VDC			
Operating Mode:	RFID On. Transmitting at 13.56 MHz			
Deviations:	None			
Comments:	None			

Test Specifications	Test Method
FCC 15.225.2012	ANSI C63.10:2009

Run #	3	Test Distance (m)	3	Antenna Height(s)	1-4m	Results	Pass



Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Test Distance (meters)	External Attenuation (dB)	Polarity/Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
13.567	32.0	10.9	1.9	13.0	3.0	0.0	Par/Perp	QP	-18.5	24.4	50.5	-26.1	EUT Horz, Ant parallel to ground, perp to EUT
13.567	27.9	10.9	1.9	14.0	5.0	0.0	Par/Perp	QP	-14.4	24.4	50.5	-26.1	EUT Horz, Ant parallel to ground, perp to EUT
13.774	9.3	10.9	1.9	195.0	3.0	0.0	Par/Perp	QP	-6.3	13.9	40.5	-26.6	EUT Horz, Ant parallel to ground, perp to EUT
13.774	7.9	10.9	1.9	195.0	5.0	0.0	Par/Perp	QP	-4.9	13.9	40.5	-26.6	EUT Horz, Ant parallel to ground, perp to EUT
13.348	8.7	10.9	1.9	177.0	3.0	0.0	Par/Perp	QP	-9.9	9.7	40.5	-30.8	EUT Horz, Ant parallel to ground, perp to EUT
13.348	6.5	10.9	1.9	178.0	5.0	0.0	Par/Perp	QP	-7.7	9.7	40.5	-30.8	EUT Horz, Ant parallel to ground, perp to EUT
13.560	46.8	10.9	2.2	69.0	3.0	0.0	Par/Perp	QP	-10.4	47.3	84.0	-36.7	EUT Vert, Ant parallel to ground, perp to EUT
13.560	44.5	10.9	2.2	69.0	5.0	0.0	Par/Perp	QP	-8.1	47.3	84.0	-36.7	EUT Vert, Ant parallel to ground, perp to EUT
13.560	46.9	10.9	2.1	238.0	3.0	0.0	Par/Perp	QP	-11.3	46.5	84.0	-37.5	EUT Horz, Ant parallel to ground, perp to EUT
13.560	44.4	10.9	2.1	238.0	5.0	0.0	Par/Perp	QP	-8.8	46.5	84.0	-37.5	EUT Horz, Ant parallel to ground, perp to EUT
13.560	45.8	10.9	1.9	276.0	3.0	0.0	Perp/Perp	QP	-14.4	42.3	84.0	-41.7	EUT Vert, Ant perp to ground, perp to EUT
13.560	42.6	10.9	1.9	276.0	5.0	0.0	Perp/Perp	QP	-11.2	42.3	84.0	-41.7	EUT Vert, Ant perp to ground, perp to EUT
13.560	46.0	10.9	1.9	108.0	3.0	0.0	Perp/Perp	QP	-16.7	40.2	84.0	-43.8	EUT Horz, Ant perp to ground, perp to EUT
13.560	42.3	10.9	1.9	108.0	5.0	0.0	Perp/Perp	QP	-13.0	40.2	84.0	-43.8	EUT Horz, Ant perp to ground, perp to EUT
13.551	20.4	10.9	1.9	0.0	3.0	0.0	Par/Perp	QP	-24.8	6.5	50.5	-44.0	EUT Horz, Ant parallel to ground, perp to EUT
13.551	14.9	10.9	1.9	0.0	5.0	0.0	Par/Perp	QP	-19.3	6.5	50.5	-44.0	EUT Horz, Ant parallel to ground, perp to EUT
13.560	40.5	10.9	1.9	41.0	3.0	0.0	Perp/Par	QP	-23.4	28.0	84.0	-56.0	EUT Vert, Ant perp to ground, parallel to EUT
13.560	35.3	10.9	1.9	41.0	5.0	0.0	Perp/Par	QP	-18.2	28.0	84.0	-56.0	EUT Vert, Ant perp to ground, parallel to EUT
13.560	40.4	10.9	1.9	221.0	3.0	0.0	Perp/Par	QP	-27.5	23.8	84.0	-60.2	EUT Horz, Ant perp to ground, parallel to EUT
13.560	34.3	10.9	1.9	221.0	5.0	0.0	Perp/Par	QP	-21.4	23.8	84.0	-60.2	EUT Horz, Ant perp to ground, parallel to EUT
13.560	36.1	10.9	1.8	249.0	3.0	0.0	Perp/Perp	QP	-28.4	18.6	84.0	-65.4	EUT on its back, Ant perp to ground, perp to EUT
13.561	29.8	10.9	1.8	252.0	5.0	0.0	Perp/Perp	QP	-22.1	18.6	84.0	-65.4	EUT on its back, Ant perp to ground, perp to EUT
13.561	43.5	10.9	1.8	233.0	3.0	0.0	Par/Perp	QP	-41.0	13.4	84.0	-70.6	EUT on its back, Ant parallel to ground, perp to EUT
13.561	34.4	10.9	2.3	229.0	5.0	0.0	Par/Perp	QP	-31.9	13.4	84.0	-70.6	EUT on its back, Ant parallel to ground, perp to EUT
13.561	32.9	10.9	2.4	360.0	3.0	0.0	Par/Perp	QP	-41.0	2.8	84.0	-81.2	EUT on its back, Ant perp to ground, parallel to EUT
13.561	23.8	10.9	1.8	230.0	5.0	0.0	Par/Perp	QP	-31.9	2.8	84.0	-81.2	EUT on its back, Ant perp to ground, parallel to EUT

DISTANCE ADJUSTMENT FACTOR FOR RADIATED EMISSIONS BELOW 30 MHZ

Method: Per 47 CFR 15.31(f)(2), the data was extrapolated based upon the measured fall-off

EUT: VRC2100 Vending Reader with RFID
S/N: V0600005
Date: 5/30/2012
Job Number: CBOR0004

Frequency (MHz)	Loop Antenna Polarity	Test Distance (meters)	Adjusted Level (dBuV/m)	Fall-Off from 3 to 5 m (dB)	Extrapolation Factor for Specification Limit (dB / decade)	Test Distance of Spec. Limit (meters)	Distance Adjustment Factor (dB)
13.348	EUT Horz, Ant parallel to ground, perp to EUT	3	19.6	2.2	9.9	30.0	-9.9
	EUT Horz, Ant parallel to ground, perp to EUT	5	17.4				-7.7
13.551	EUT Horz, Ant parallel to ground, perp to EUT	3	31.3	5.5	24.8	30.0	-24.8
	EUT Horz, Ant parallel to ground, perp to EUT	5	25.8				-19.3
13.560	EUT Horz, Ant parallel to ground, perp to EUT	3	57.8	2.5	11.3	30.0	-11.3
	EUT Horz, Ant parallel to ground, perp to EUT	5	55.3				-8.8
13.560	EUT Horz, Ant perp to ground, parallel to EUT	3	51.3	6.1	27.5	30.0	-27.5
	EUT Horz, Ant perp to ground, parallel to EUT	5	45.2				-21.4
13.560	EUT Horz, Ant perp to ground, perp to EUT	3	56.9	3.7	16.7	30.0	-16.7
	EUT Horz, Ant perp to ground, perp to EUT	5	53.2				-13.0
13.560	EUT on its back, Ant parallel to ground, perp to EUT	3	54.4	9.1	41.0	30.0	-41.0
	EUT on its back, Ant parallel to ground, perp to EUT	5	45.3				-31.9
13.560	EUT on its back, Ant par to ground, parallel to EUT	3	43.8	9.1	41.0	30.0	-41.0
	EUT on its back, Ant par to ground, parallel to EUT	5	34.7				-31.9
13.560	EUT on its back, Ant perp to ground, perp to EUT	3	47.0	6.3	28.4	30.0	-28.4
	EUT on its back, Ant perp to ground, perp to EUT	5	40.7				-22.1
13.560	EUT Vert, Ant parallel to ground, perp to EUT	3	57.7	2.3	10.4	30.0	-10.4
	EUT Vert, Ant parallel to ground, perp to EUT	5	55.4				-8.1
13.560	EUT Vert, Ant perp to ground, parallel to EUT	3	51.4	5.2	23.4	30.0	-23.4
	EUT Vert, Ant perp to ground, parallel to EUT	5	46.2				-18.2
13.560	EUT Vert, Ant perp to ground, perp to EUT	3	56.7	3.2	14.4	30.0	-14.4
	EUT Vert, Ant perp to ground, perp to EUT	5	53.5				-11.2
13.567	EUT Horz, Ant parallel to ground, perp to EUT	3	42.9	4.1	18.5	30.0	-18.5
	EUT Horz, Ant parallel to ground, perp to EUT	5	38.8				-14.4
13.774	EUT Horz, Ant parallel to ground, perp to EUT	3	20.2	1.4	6.3	30.0	-6.3
	EUT Horz, Ant parallel to ground, perp to EUT	5	18.8				-4.9

Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data. The test data represents the configuration / operating mode/ model that produced the highest emission levels as compared to the specification limit.

MODES OF OPERATION

RFID on. Transmitting at 13.56 MHz

POWER SETTINGS INVESTIGATED

24 VDC

CONFIGURATIONS INVESTIGATED

CBOR0004 - 1

FREQUENCY RANGE INVESTIGATED

Start Frequency	9 KHz	Stop Frequency	1000 MHz
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SAMPLE CALCULATIONS

Radiated Emissions: Field Strength = Measured Level + Antenna Factor + Cable Factor - Amplifier Gain + Distance Adjustment Factor + External Attenuation

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Interval
OC10 Cables	N/A	10kHz-1GHz RE Cables	OCH	6/24/2011	12 mo
Spectrum Analyzer	Agilent	E4440A	AFG	5/16/2012	12 mo
Antenna, Loop	EMCO	6502	AZB	12/6/2010	24 mo

MEASUREMENT BANDWIDTHS

Frequency Range (MHz)	Peak Data (kHz)	Quasi-Peak Data (kHz)	Average Data (kHz)
0.01 - 0.15	1.0	0.2	0.2
0.15 - 30.0	10.0	9.0	9.0
30.0 - 1000	100.0	120.0	120.0
Above 1000	1000.0	N/A	1000.0

MEASUREMENT UNCERTAINTY

A measurement uncertainty estimation has been performed for each test per our internal quality document WP 342. The estimation is used to compare the measured result with its "true" or theoretically correct value. The expanded measurement uncertainty for radiated emissions measurements is less than +/- 4 dB, and for conducted emissions measurements is less than +/- 2.7 dB. Our measurement data meets or exceeds the measurement uncertainty requirements of CISPR 16-4; therefore, the test data can be compared directly to the specification limit to determine compliance. The calculations for measurement uncertainty are available upon request.

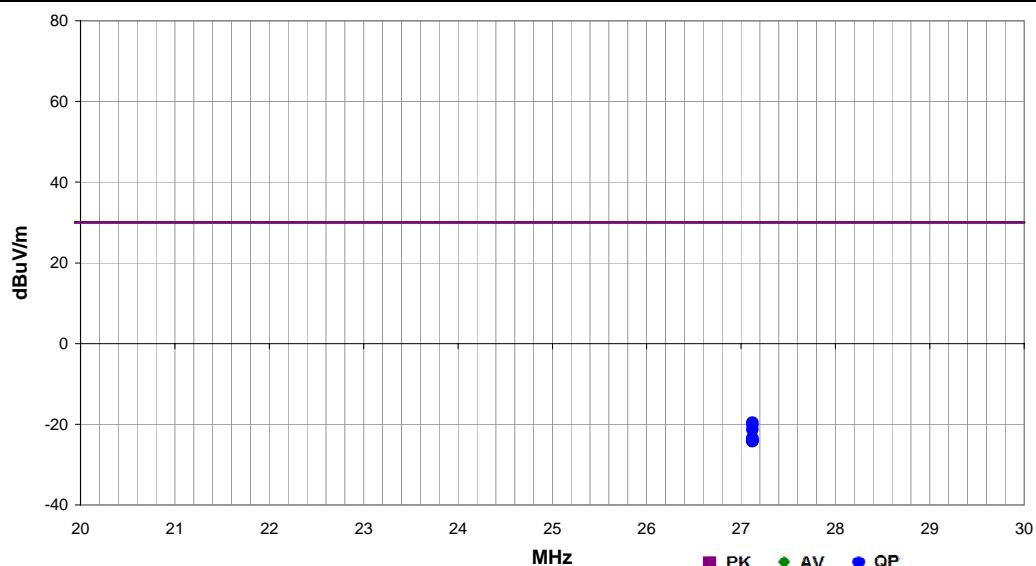
TEST DESCRIPTION

The antennas to be used with the EUT were tested. The EUT was continuously transmitting while set to the channel specified. While scanning, emissions from the EUT were maximized by rotating the EUT, adjusting the measurement antenna height and orientation in 3 orthogonal planes, the EUT and/or associated antenna is positioned in 3 orthogonal planes (per ANSI C63.10). An active loop antenna was used below 30 MHz for this test in order to provide sufficient measurement sensitivity.

Work Order:	CBOR0004	Date:	05/31/12	
Project:	None	Temperature:	24.65 °C	
Job Site:	OC10	Humidity:	47.77% RH	
Serial Number:	V0600005	Barometric Pres.:	1012.8 mbar	Tested by: Johnny Candelas
EUT:	VRC2100 Vending Reader with RFIC			
Configuration:	1			
Customer:	CBORD Group, Inc.			
Attendees:	John Darjany			
EUT Power:	24 VDC			
Operating Mode:	RFID on. Transmitting at 13.56 MHz			
Deviations:	None			
Comments:	None			

Test Specifications	Test Method
FCC 15.225:2012	ANSI C63.10:2009

Run #	8	Test Distance (m)	3	Antenna Height(s)	1-4m	Results	Pass



Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Test Distance (meters)	External Attenuation (dB)	Polarity/Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
27.122	11.3	9.1	1.9	203.0	3.0	0.0	Horz	QP	-40.0	-19.6	30.0	-49.6	EUT Vert, Ant perp to ground, perp to eut
27.122	10.8	9.1	1.9	202.0	3.0	0.0	Horz	QP	-40.0	-20.1	30.0	-50.1	EUT on its back, Ant perp to ground, perp to eut
27.121	9.6	9.1	1.9	135.0	3.0	0.0	Horz	QP	-40.0	-21.3	30.0	-51.3	EUT Horiz, Ant perp to ground, perp to eut
27.122	7.4	9.1	1.9	161.0	3.0	0.0	Horz	QP	-40.0	-23.5	30.0	-53.5	EUT on its back, Ant perp to ground, parallel to eut
27.122	7.3	9.1	1.9	288.0	3.0	0.0	Vert	QP	-40.0	-23.6	30.0	-53.6	EUT on its back, Ant parallel to ground, perp to eut
27.119	6.8	9.1	1.9	271.0	3.0	0.0	Vert	QP	-40.0	-24.1	30.0	-54.1	EUT Vert, Ant parallel to ground, perp to eut
27.121	6.8	9.1	1.9	300.0	3.0	0.0	Horz	QP	-40.0	-24.1	30.0	-54.1	EUT Vert, Ant perp to ground, parallel to eut
27.122	6.8	9.1	1.9	186.0	3.0	0.0	Horz	QP	-40.0	-24.1	30.0	-54.1	EUT Horiz, Ant perp to ground, parallel to eut
27.121	6.7	9.1	1.9	162.0	3.0	0.0	Vert	QP	-40.0	-24.2	30.0	-54.2	EUT Horiz, Ant parallel to ground, perp to eut



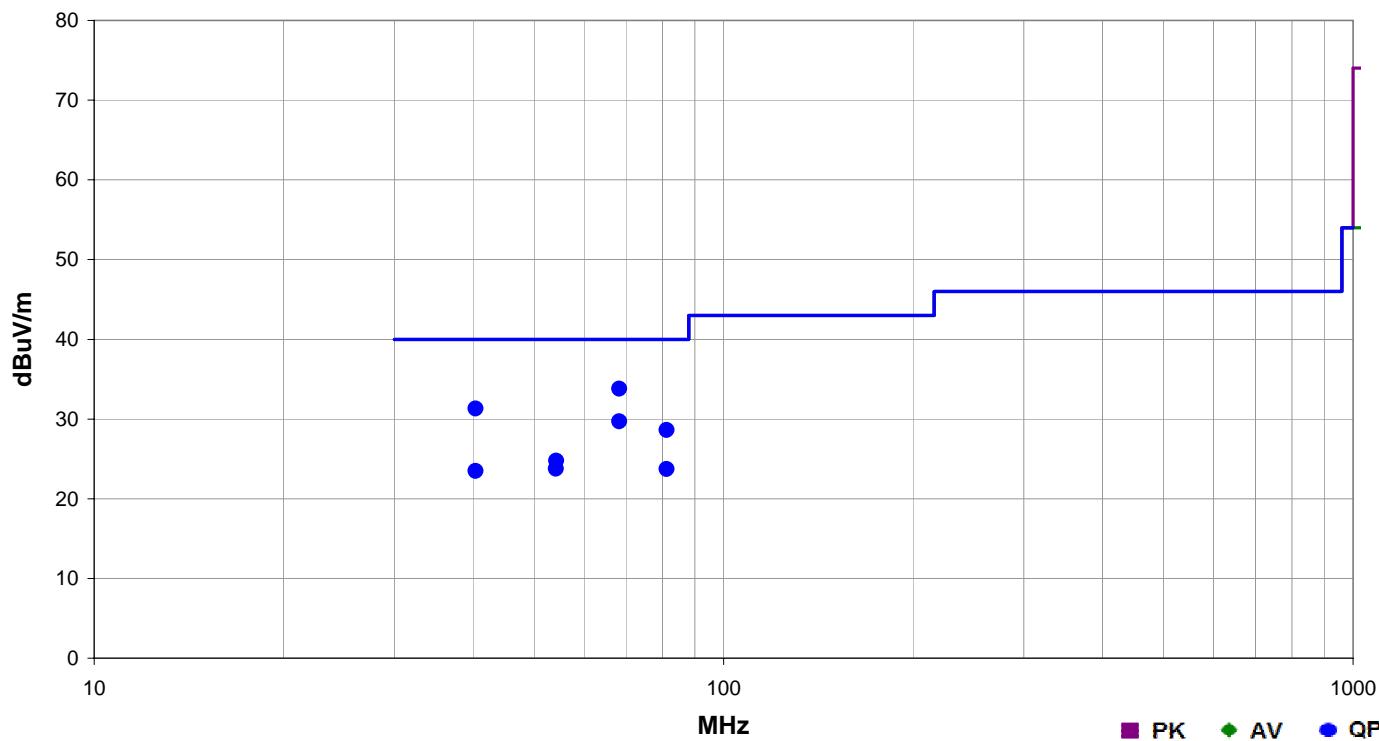
FIELD STRENGTH OF SPURIOUS EMISSIONS

PSA-ESCI 2012.05.07
PSA-ESCI Version 2011.12.21

Work Order:	CBOR0004	Date:	05/30/12		
Project:	None	Temperature:	23.93 °C		
Job Site:	OC10	Humidity:	49.5% RH		
Serial Number:	V0600005	Barometric Pres.:	1017 mbar		
EUT:	VRC2100 Vending Reader with RFID				
Configuration:	1				
Customer:	CBORD Group, Inc.				
Attendees:	John Darjany				
EUT Power:	24 VDC				
Operating Mode:	RFID on. Transmitting at 13.56 MHz				
Deviations:	None				
Comments:	Worst case orientation: EUT Vert, Ant perp to ground, perp to eut.				

Test Specifications	Test Method
FCC 15.225:2012	ANSI C63.10:2009

Run #	Test Distance (m)	Antenna Height(s)	1-4m	Results	Pass
7	3				



Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Test Distance (meters)	External Attenuation (dB)	Polarity/Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)
68.244	39.2	-5.4	3.8	340.0	3.0	0.0	Horz	QP	-40.0	33.8	40.0	-6.2
40.348	30.9	0.4	1.0	244.0	3.0	0.0	Vert	QP	-40.0	31.3	40.0	-8.7
68.241	35.1	-5.4	1.9	2.0	3.0	0.0	Vert	QP	-40.0	29.7	40.0	-10.3
81.208	34.1	-5.5	1.0	33.0	3.0	0.0	Vert	QP	-40.0	28.6	40.0	-11.4
54.193	28.3	-3.5	1.0	215.0	3.0	0.0	Vert	QP	-40.0	24.8	40.0	-15.2
54.169	27.3	-3.5	3.7	269.0	3.0	0.0	Horz	QP	-40.0	23.8	40.0	-16.2
81.209	29.2	-5.5	3.2	163.0	3.0	0.0	Horz	QP	-40.0	23.7	40.0	-16.3
40.357	23.1	0.4	3.3	239.0	3.0	0.0	Horz	QP	-40.0	23.5	40.0	-16.5

Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data.

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Interval
Chamber, Temperature/Humidity	Cincinnati Sub Zero (CSZ)	ZPHS-32-3.5-SCT/AC	TBE	NCR	0 mo
Near Field Probe	EMCO	7405	IPI	NCR	0 mo
Spectrum Analyzer	Agilent	E4440A	AFA	5/9/2011	13 mo

MEASUREMENT UNCERTAINTY

A measurement uncertainty estimation has been performed for each test per our internal quality document WP 342. The estimation is used to compare the measured result with its "true" or theoretically correct value. The expanded measurement uncertainty for radiated emissions measurements is less than +/- 4 dB, and for conducted emissions measurements is less than +/- 2.7 dB. Our measurement data meets or exceeds the measurement uncertainty requirements of CISPR 16-4; therefore, the test data can be compared directly to the specification limit to determine compliance. The calculations for measurement uncertainty are available upon request.

TEST DESCRIPTIONVariation of Supply Voltage

The primary supply voltage was varied from the nominal of 120 VAC. An AC lab supply was used to vary the supply voltage 0.85% to 1.15% of the nominal voltage..

Variation of Ambient Temperature

Using a temperature chamber, the transmit frequency was recorded at the extremes of the specified temperature range (0° to +50° C) and at 10°C intervals.

The antenna is integral to the EUT, so a radiated measurement was made using a spectrum analyzer and a near field probe. The spectrum analyzer is equipped with a precision frequency reference that exceeds the stability requirement of the EUT.

EMC

FREQUENCY STABILITY

EUT: VRC2100 Vending Reader with RFID

Work Order: CBOR0004

Serial Number: V0600005

Date: 05/31/12

Customer: CBORD Group, Inc.

Temperature: 25.91 °C

Attendees: None

Humidity: 47%

Project: None

Barometric Pres.: 1011 mb

Tested by: Johnny Candelas

Power: 24 VDC

Job Site: OC13

TEST SPECIFICATIONS

TEST METHOD

FCC 15.225:2011

ANSI C63.10:2009

COMMENTS

RFID On. Transmitting at 13.56 MHz

DEVIATIONS FROM TEST STANDARD

No Deviations

Configuration #

1

Signature



FREQUENCY STABILITY

Frequency Stability with Variation of DC Voltage (Ambient Temperature = 20° C)

Voltage (VAC)	Assigned Frequency (MHz)	Measured Frequency (MHz)	Tolerance (ppm)	Specification (ppm)
102 (Max)	13.560000	13.561128	83.19	100
120 (100%)	13.560000	13.561107	81.64	100
138 (Min)	13.560000	13.561113	82.08	100

Frequency Stability with Variation of Ambient Temperature (Primary Supply = 24 VDC)

Temp (°C)	Assigned Frequency (MHz)	Measured Frequency (MHz)	Tolerance (ppm)	Specification (ppm)
50	13.560000	13.561083	79.87	100
40	13.560000	13.561063	78.39	100
30	13.560000	13.561092	80.53	100
20	13.560000	13.561107	81.64	100
10	13.560000	13.561145	84.44	100
0	13.560000	13.561173	86.50	100

AC POWERLINE CONDUCTED EMISSIONS

Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data.

MODES OF OPERATION

RFID ON.

POWER SETTINGS INVESTIGATED

24 VDC

CONFIGURATIONS INVESTIGATED

CBOR0004 - 1

SAMPLE CALCULATIONS

Conducted Emissions: Adjusted Level = Measured Level + Transducer Factor + Cable Attenuation Factor + External Attenuator

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Interval
LISN	Solar	9252-50-R-24-BNC	LIC	4/24/2012	12 mo
LISN	Solar	9252-50-24-BNC	LIA	6/13/2011	12 mo
Attenuator	Pasternack	6N10W-20	AWC	3/1/2012	12 mo
High Pass Filter	TTE	H97-100K-50-720B	HFP	3/1/2012	24 mo
OC06 Cables	N/A	Telecom Cables	OCP	4/6/2012	12 mo
OC06 Cables	N/A	CE Cables	OCM	4/6/2012	12 mo
Receiver	Rohde & Schwarz	ESCI	ARF	4/26/2012	12 mo

MEASUREMENT BANDWIDTHS

Frequency Range (MHz)	Peak Data (kHz)	Quasi-Peak Data (kHz)	Average Data (kHz)
0.01 - 0.15	1.0	0.2	0.2
0.15 - 30.0	10.0	9.0	9.0
30.0 - 1000	100.0	120.0	120.0
Above 1000	1000.0	N/A	1000.0

Measurements were made using the bandwidths and detectors specified. No video filter was used.

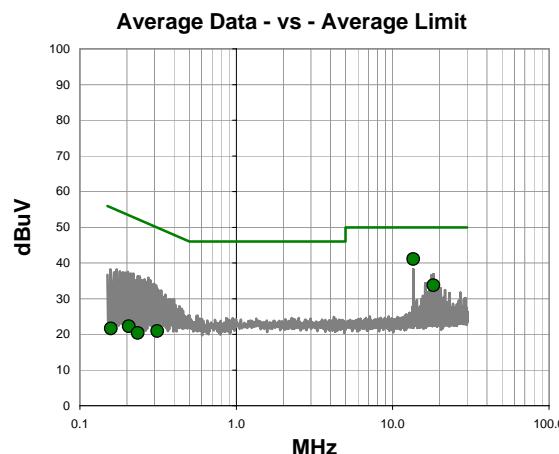
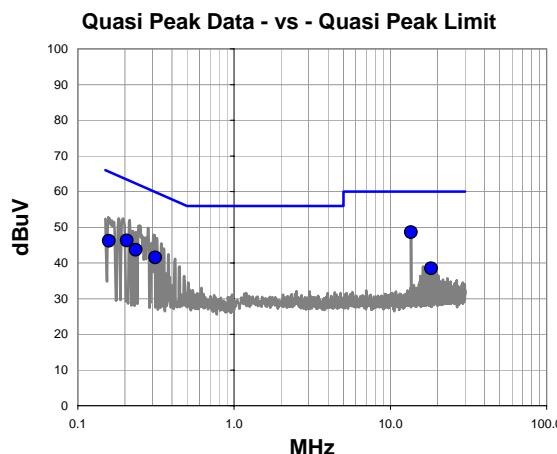
MEASUREMENT UNCERTAINTY

A measurement uncertainty estimation has been performed for each test per our internal quality document WP 342. The estimation is used to compare the measured result with its "true" or theoretically correct value. The expanded measurement uncertainty for radiated emissions measurements is less than +/- 4 dB, and for conducted emissions measurements is less than +/- 2.7 dB. Our measurement data meets or exceeds the measurement uncertainty requirements of CISPR 16-4; therefore, the test data can be compared directly to the specification limit to determine compliance. The calculations for measurement uncertainty are available upon request.

TEST DESCRIPTION

Using the mode of operation and configuration noted within this report, conducted emissions tests were performed. The frequency range investigated (scanned), is also noted in this report. Conducted power line measurements are made, unless otherwise specified, over the frequency range from 150 kHz to 30 MHz to determine the line-to-ground radio-noise voltage that is conducted from the EUT power-input terminals that are directly (or indirectly via separate transformer or power supplies) connected to a public power network. Equipment is tested with power cords that are normally used or that have electrical or shielding characteristics that are the same as those cords normally used. Typically those measurements are made using a LISN (Line Impedance Stabilization Network), the 50ohm measuring port is terminated by a 50ohm EMI meter or a 50ohm resistive load. All 50ohm measuring ports of the LISN are terminated by 50ohm.

Work Order:	CBOR0004	Date:	05/30/12				
Project:	None	Temperature:	25.09				
Job Site:	OC06	Humidity:	44.17				
Serial Number:	5	Barometric Pres.:	1019	Tested by: Jaemi Suh			
EUT:	VRC2100 Vending Reader with RFID						
Configuration:	1						
Customer:	CBORD Group, Inc.						
Attendees:	John Darjany						
EUT Power:	24 VDC						
Operating Mode:	RFID ON.						
Deviations:	None						
Comments:	None						
Test Specifications		Test Method					
FCC 15.207:2012		ANSI C63.10:2009					
Run #	1	Line:	High Line	Ext. Attenuation:	20	Results	Pass



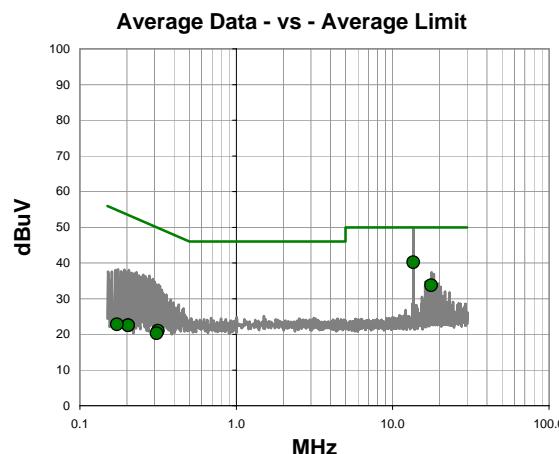
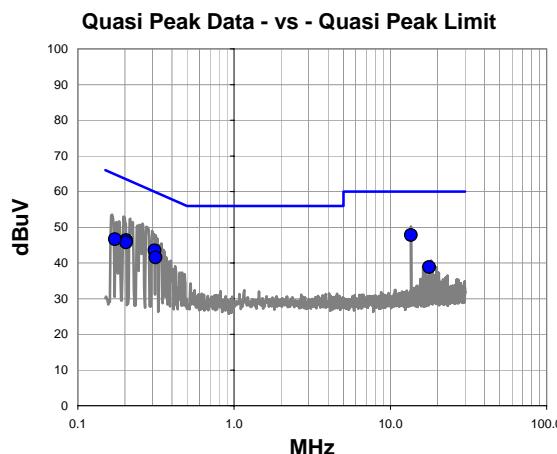
Quasi Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Compared to Spec. (dB)
13.562	28.0	20.6	48.6	60.0	-11.4
0.206	26.2	20.1	46.3	63.4	-17.1
0.313	21.4	20.1	41.5	59.9	-18.4
0.235	23.6	20.1	43.7	62.3	-18.6
0.158	26.1	20.1	46.2	65.6	-19.4
18.246	17.6	20.9	38.5	60.0	-21.5

Average Data - vs - Average Limit

Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Compared to Spec. (dB)
13.562	20.5	20.6	41.1	50.0	-8.9
18.246	12.8	20.9	33.7	50.0	-16.3
0.313	0.8	20.1	20.9	49.9	-29.0
0.206	2.1	20.1	22.2	53.4	-31.2
0.235	0.3	20.1	20.4	52.3	-31.9
0.158	1.5	20.1	21.6	55.6	-34.0

Work Order:	CBOR0004	Date:	05/30/12				
Project:	None	Temperature:	25.09				
Job Site:	OC06	Humidity:	44.17				
Serial Number:	5	Barometric Pres.:	1019	Tested by: Jaemi Suh			
EUT:	VRC2100 Vending Reader with RFID						
Configuration:	1						
Customer:	CBORD Group, Inc.						
Attendees:	John Darjany						
EUT Power:	24 VDC						
Operating Mode:	RFID ON.						
Deviations:	None						
Comments:	None						
Test Specifications		Test Method					
FCC 15.207:2012		ANSI C63.10:2009					
Run #	2	Line:	Neutral	Ext. Attenuation:	20	Results	Pass



Quasi Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Compared to Spec. (dB)
13.560	27.2	20.6	47.8	60.0	-12.2
0.310	23.4	20.1	43.5	60.0	-16.5
0.204	26.3	20.1	46.4	63.4	-17.0
0.204	25.6	20.1	45.7	63.4	-17.7
0.173	26.5	20.1	46.6	64.8	-18.2
0.315	21.4	20.1	41.5	59.8	-18.3
17.696	17.9	20.9	38.8	60.0	-21.2

Average Data - vs - Average Limit

Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Compared to Spec. (dB)
13.560	19.6	20.6	40.2	50.0	-9.8
17.696	12.8	20.9	33.7	50.0	-16.3
0.315	0.9	20.1	21.0	49.8	-28.8
0.310	0.2	20.1	20.3	50.0	-29.7
0.204	2.4	20.1	22.5	53.4	-30.9
0.204	2.4	20.1	22.5	53.4	-30.9
0.173	2.7	20.1	22.8	54.8	-32.0