Cardinal Health

EMC Test Report

Tag Associator
Model 16200

Report No. CRDN0216 Rev 01

Report Prepared By

NORTHWEST EMC

www.nwemc.com
1-888-EMI-CERT

NORTHWEST EMC

22975 NW Evergreen Parkway
Suite 400
Hillsboro, Oregon 97124

Certificate of Test

Last Date of Test: December 8, 2008

Cardinal Health

Model: Tag Associator

Emissions			
Test Description	**Specification**	**Test Method**	**Pass/Fail**
Spurious Radiated Emissions	FCC 15.209:2008	ANSI C63.4:2003	**Pass**
Field Strength of Fundamental	FCC 15.209:2008	ANSI C63.4:2003	**Pass**
Conducted Emissions	FCC 15.207:2008	ANSI C63.4:2003	**Pass**
Radiated Emissions	IEC 60601-1-2:2007 Class A	CISPR 11:2004 (Amended by A2:2006)	**Pass**

Modifications made to the product
See the Modifications section of this report

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-2).

Approved By:

Donald Facteau, IS Manager

NVLAP Lab Code: 200676-0

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 Number	Description	Date	Page Number
01	Added Model Number to cover page	3/31/09	1

FCC: Accredited by NVLAP for performance of FCC radio, digital, and ISM device testing. Our Open Area Test Sites, certification chambers, and conducted measurement facilities have been fully described in reports filed with the FCC and accepted by the FCC in letters maintained in our files. Northwest EMC has been accredited by ANSI to ISO / IEC Guide 65 as a product certifier. We have been designated by the FCC as a Telecommunications Certification Body (TCB). This allows Northwest EMC to certify transmitters to FCC specifications in accordance with 47 CFR 2.960 and 2.962.

NVLAP: Northwest EMC, Inc. is accredited under the United States Department of Commerce, National Institute of Standards and Technology, and National Voluntary Laboratory Accreditation Program for satisfactory compliance with the requirements of ISO/IEC 17025 for Testing Laboratories. The NVLAP accreditation encompasses Electromagnetic Compatibility Testing in accordance with the European Union EMC Directive 2004/108/EC, and ANSI C63.4. Additionally, Northwest EMC is accredited by NVLAP to perform radio testing in accordance with the European Union R&TTE Directive 1999/5/EEC, the requirements of FCC, and the RSS radio standards for Industry Canada.

NVLAP LAB CODE 200629-0
NVLAP LAB CODE 200630-0
NVLAP LAB CODE 200676-0
NVLAP LAB CODE 200761-0

Industry Canada: Accredited by NVLAP for performance of Industry Canada RSS and ICES testing. Our Open Area Test Sites and certification chambers comply with RSS-Gen, Issue 2 and have been filed with Industry Canada and accepted. Northwest EMC has been accredited by ANSI to ISO / IEC Guide 65 as a product certifier. We have been designated by NIST and recognized by Industry Canada as a Certification Body (CB) per the APEC Mutual Recognition Arrangement (MRA). This allows Northwest EMC to certify transmitters to Industry Canada technical requirements. (*Site Filing Numbers - Hillsboro: 2834D-1, 2834D-2, Sultan: 2834C-1, Irvine: 2834B-1, 2834B-2)*

CAB: Designated by NIST and validated by the European Commission as a Conformity Assessment Body (CAB) to conduct tests and approve products to the EMC directive and transmitters to the R&TTE directive, as described in the U.S. - EU Mutual Recognition Agreement.

TÜV Product Service: Included in TUV Product Service Group's Listing of Recognized Laboratories. It qualifies in connection with the TUV Certification after Recognition of Agent's Testing Program for the product categories and/or standards shown in TUV's current Listing of CARAT Laboratories, available from TUV. A certificate was issued to represent that this laboratory continues to meet TUV's CARAT Program requirements. Certificate No. USA0604C.

TÜV Rheinland: Authorized to carryout EMC tests by order and under supervision of TÜV Rheinland. This authorization is based on "Conditions for EMC-Subcontractors" of November 1992.

NEMKO: Assessed and accredited by NEMKO (Norwegian testing and certification body) for European emissions and immunity testing. As a result of NEMKO's laboratory assessment, they will accept test results from Northwest EMC, Inc. for product certification (Authorization No. ELA 119).

Australia/New Zealand: The National Association of Testing Authorities (NATA), Australia has been appointed by the ACA as an accreditation body to accredit test laboratories and competent bodies for EMC standards. Accredited test reports or assessments by competent bodies must carry the NATA logo. Test reports made by an overseas laboratory that has been accredited for the relevant standards by an overseas accreditation body that has a Mutual Recognition Agreement (MRA) with NATA are also accepted as technical grounds for product conformity. The report should be endorsed with the respective logo of the accreditation body (NVLAP).

VCCI: Accepted as an Associate Member to the VCCI, Acceptance No. 564. Conducted and radiated measurement facilities have been registered in accordance with Regulations for Voluntary Control Measures, Article 8. *(Registration Numbers. - Hillsboro: C-1071, R-1025, C-2687, T-289, and R-2318, Irvine: R-1943, C-2766, and T-298, Sultan: R-871, C-1784, and T-294).*

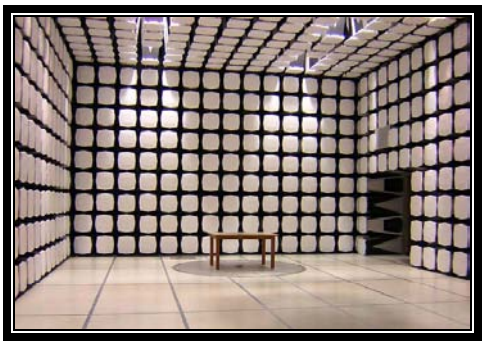
BSMI: Northwest EMC has been designated by NIST and validated by C-Taipei (BSMI) as a CAB to conduct tests as described in the APEC Mutual Recognition Agreement (US0017). License No.SL2-IN-E-1017.

GOST: Northwest EMC, Inc. has been assessed and accredited by the Russian Certification bodies Certinform VNIINMASH, CERTINFO, SAMTES, and Federal CHEC, to perform EMC and Hygienic testing for Information Technology Products. As a result of their laboratory assessment, they will accept test results from Northwest EMC, Inc. for product certification

MIC: Northwest EMC, Inc is a CAB designated by MRA partners and recognized by Korea. (*Assigned Lab Numbers: Hillsboro: US0017, Irvine: US0158, Sultan: US0157)*

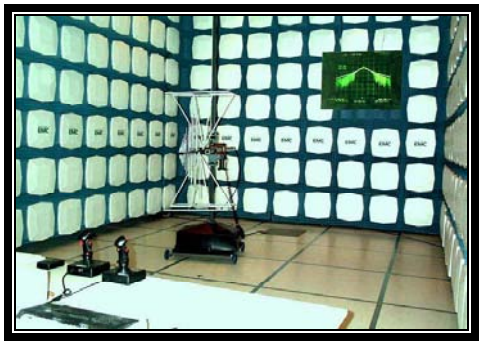
SCOPE

For details on the Scopes of our Accreditations, please visit:
http://www.nwemc.com/accreditations/



California – Orange County Facility
Labs OC01 – OC13

41 Tesla Ave. Irvine, CA 92618
(888) 364-2378 Fax: (503) 844-3826



Oregon – Evergreen Facility
Labs EV01 – EV11

22975 NW Evergreen Pkwy. Suite 400 Hillsboro, OR 97124
(503) 844-4066 Fax: (503) 844-3826

Washington – Sultan Facility
Labs SU01 – SU07

14128 339th Ave. SE Sultan, WA 98294
(888) 364-2378

Party Requesting the Test

Company Name:	Cardinal Health
Address:	10020 Pacific Mesa Blvd
City, State, Zip:	San Diego, CA 92121
Test Requested By:	James Owen
Model:	Tag Associator
First Date of Test:	November 5, 2008
Last Date of Test:	December 8, 2008
Receipt Date of Samples:	November 5, 2008
Equipment Design Stage:	Production
Equipment Condition:	No Damage

Information Provided by the Party Requesting the Test

Functional Description of the EUT (Equipment Under Test):
The device is a 120 kHz transmitter used in RFID applications.

Testing Objective:
The primary objective of testing is to verify compliance to the standards. The test configuration is established as a “worst-case” but representative "Current Production Configuration", (Equipment as designed and manufactured). Please see EMC Test Protocol for more information.

CONFIGURATION 1 CRDN0216

EUT			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
RFID Tag Associator	Cardinal Health	12744-02	006

Peripherals in test setup boundary			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Logitech Deluxe 250 Keyboard	Logitech Corp.	Y-U776	820-000310

Cables					
Cable Type	**Shield**	**Length (m)**	**Ferrite**	**Connection 1**	**Connection 2**
AC Cable	Yes	3.0m	No	RFID Tag Associator	AC Mains
USB	No	1.7m	Yes	Logitech Deluxe 250 Keyboard	RFID Tag Associator
LAN	No	1.8m	No	RFID Tag Associator	Unterminated
PA = Cable is permanently attached to the device. Shielding and/or presence of ferrite may be unknown.					

Equipment modifications					
Item	Date	Test	Modification	Note	Disposition of EUT
1	11/5/2008	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.
2	11/5/2008	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.
3	11/11/2008	Radiated 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	12/8/2008	AC Powerline Conducted Emissions	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	Scheduled testing was complete.

Title:	***EMC Testing for RFID Tag Associator***
Engineer:	***James Owen***
Quality Engineer:	***Abdirizack Ahmed***
Technical Reviewer:	***John Smith***
Date:	***10/27/2008***
Document Number:	***10000081781-00***

1. Purpose

The purpose of this document is to define the Intentional Emissions test regimen, configuration and acceptance for the Cardinal Health product under test according to FCC 15.33(a)(1). This system is known as the '**RFID Tag Associator**'. The reason for the test is to evaluate the compliance of product to unlicensed and License- Exempt devices test standards for submission to wireless granting authorities for approval. Section 3.0 and 4.0 of the document contains the configuration of product to be tested.

Tests to be performed are:

- Radiated Emissions per FCC 15.209(a) & RSS-210 Paragraph 2.6 Tables 3
- Conducted Emissions per FCC 15.207(a)
- Occupied Bandwidth per RSSGEN Paragraph 4.6
- RF Exposure per RSS-102 Paragraph 2

See Appendix I for test applicability.

2. Background:

The Tag Associator (TA) is a subsystem of the Pyxis RFID Supply Cabinet for the monitoring and inventory tracking of stents. The TA is a device which tests the placement, operation and performance of a RFID Tag affixed to a Stent package. The TA creates a registry for and association between the Stent product and affixed RFID Tag. The TA creates a readable image of the stent package ID and product information and stores all this information in a registry for inventory control and future reference.

3. Objectives:

The objectives of this test are to:

- Ensure that Tag Associator will be able to meet the formal compliance standards.
- Evaluate to discover and correct possible problems at this stage of the design and development process.

4. Reference Documents:

Following is a list of the applicable standards for verification including particular device standards or clauses, which amend the base standard and referenced subordinate test standards.

4.1 Code of Federal Regulations (United States):

- **Title 47 Telecommunication**

4.2 Industry of Canada Spectrum Management and Telecommunications (Canada):

- **RSS-GEN Issue 2:** General Requirements and Information for the Certification of Radiocommunication Equipment
- **RSS-210 Issue 7:** Low-power Licence-exempt Radiocommunication Devices (All Frequency Bands): Category I Equipment
- **RSS-102 Issue 2:** Radio Frequency Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands)

5. Test Material/Article:

A "Current Production Configuration", (Equipment as designed and manufactured), build intended to be the same as a released product and accessories shall be used for the test. Any additions or deviations shall be identified on the Test Report Documentation.

The following is a list of parts under test:

- One unit of RFID Tag Associator, P/N 127442-01, with all accessories cable, and software running in a product representative fashion.

  Note: Unique number and/or marking that identify equipment under test will be recorded in the report.

6. Sample Size and Statistical Rationale:

Standard IEC/UL 60601-1:2005 w/ Corrigendum 1, Clause 3.135, defines:

TYPE TEST

Test on a representative sample of the equipment with the objective of determining if the equipment, as designed and manufactured, can meet the requirements of this standard.

7. Acceptance Criteria:

Compliance is met when sampled product is shown to perform in accordance to the requirements set forth in the applied standards. Documentation will be submitted to an approving agency for review and providing a grant of authorization to operate as intended.

8. *Test Facility:*

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

9. Test Equipment/Fixture(s)/Technician:

The test equipment and fixture(s) used for the evaluation, as well as the test technician are indicated in the test data included in the test report.

10. *Test Set-up*

Test sample shall be set-up and configured in compliance with manufacturer's specifications as defined in the DFU's documentation.

11. Test Procedure

The primary objective of testing is to verify compliance to the standards. The test configuration is established as a "worst-case" but representative "Current Production Configuration", (Equipment as designed and manufactured). During immunity testing it shall be verified that an unexpected operation does not occur as a result to the EMC event, unless allowed by the standard and the System Risk and Hazards Analysis. The following statement shall serve as a requirement:

"The safe functioning of the EQUIPMENT as specified by the manufacturer shall not be impaired by one or more of the immunity tests, or the EQUIPMENT shall fail without creating a SAFETY HAZARD by these tests. In the latter case, the (non-hazardous) failure mode and the failure level to worst case shall be specified by the manufacturer."

11.1 Specific Test Levels

Severity levels defined below represent the maximum increased levels as specified in the standard.

11.1.1 Radiated Emissions [FCC 15.209 & RSS-210]: Fundamental and spurious emissions shall be evaluated starting from the fundamental frequency of (approx) 119.7 kHz to the 10^{th} harmonic of the fundamental. System mode of operation will be with all transmitters' active and polling for tags. Power source to device under test will be 120 volts AC and 60 hertz frequency will be used and documented in the report.

11.1.2 Conducted Emissions - Terminal Disturbance Voltages [FCC 15.207]: Emission levels will be evaluated to the required limits as called from 150 kHz to 30 MHz. System mode of operation will be with all transmitters' active and polling for tags. Power source to device under test will be 120 volt AC and 60 hertz frequency will be used and documented in the report.

11.1.3 Occupied Bandwidth [RSSGEN]: The span of the analyzer shall be set to capture all products of the modulation process, including the emission skirts. The resolution bandwidth shall be set as close to 1% of the selected span as is possible without being below 1%. The video bandwidth shall be set to 3 times the resolution bandwidth. Video averaging is not permitted. Where practical, a sampling detector shall be used since a peak or, peak hold, may produce a wider bandwidth than actual.

11.1.4 RF Exposure [RSS-102]: Procedures found in Health Canada Safety Code 6 Appendix V shall be used for this evaluation. Compliance requirements are found in RSS-102 paragraph 4.2 for general public RF limits and paragraph 4.4 for controlled use devices. It is the objective to meet general public RF limits.

APPENDIX I

Test Applicability & Configuration Matrix

Product Configuration	FCC 15.207 – Conducted Emissions	FCC 15.209 & RSS-210 - Radiated Emissions	RSS-GEN – Occupied Bandwidth	RSS-102 – RF Exposure
1. Voltage and line frequency	**120/60**	**120/60**	**120/60**	**120/60**
1. Required Discipline ✓	✓	✓	✓	✓

Configuration Details: See section 5 in this protocol.

12. Approval

See SAP for Electronic Approvals

FIELD STRENGTH OF FUNDAMENTAL

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

Tag Inventory

MODE USED FOR FINAL DATA

Tag Inventory

POWER SETTINGS INVESTIGATED

120VAC/60Hz

POWER SETTINGS USED FOR FINAL DATA

120VAC/60Hz

FREQUENCY RANGE INVESTIGATED

Start Frequency	119.7 KHz	Stop Frequency	119.7 KHz

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
OC08 Cables	None	30MHz-6GHz RE Cables	OCB	2/1/2008	13
Antenna, Loop	EMCO	6502	AZB	12/2/2006	24
Spectrum Analyzer	Agilent	E4443A	AAR	12/14/2007	13

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

Measurement uncertainty is used to reflect the accuracy of the measured result as compared with its "true" or theoretically correct value. Our measurement data meets or exceeds the measurement uncertainty requirements of CISPR 16-4. In the case of transient tests our test equipment has been demonstrated by calibration to provide at least a 95% confidence that it complies with the test specification requirements. The measurement uncertainty for any test is available upon request.

TEST DESCRIPTION

The antennas to be used with the EUT were tested. The EUT was transmitting and/or receiving while set at the one channel available. While scanning, emissions from the EUT were maximized by rotating the EUT, adjusting the measurement antenna height and polarization, and manipulating the EUT antenna in 3 orthogonal planes if applicable (per ANSI C63.4:2003).

As specified in 47 CFR 15.31, due to the low level emissions measurments were made at an EUT to antenna distance of 10 meters. As specified for measuremests below 30 MHz, the data was then corrected by using the square of an inverse linear distance extrapolation factor (40 dB/decade)

NORTHWEST EMC

FIELD STRENGTH OF FUNDAMENTAL

PSA 2007.05.07
EMI 2008.1.9

EUT:	Tag Associator	Work Order:	CRDN0216
Serial Number:	6	Date:	11/05/08
Customer:	Cardinal Health	Temperature:	21C
Attendees:	Jim Owen	Humidity:	44%
Project:	None	Barometric Pres.:	1018 mb
Tested by:	Jaemi Suh	Power: 120VAC/60Hz	Job Site: OC08

TEST SPECIFICATIONS	Test Method
FCC 15.209:2008	ANSI C63.4:2003

TEST PARAMETERS			
Antenna Height(s) (m)	1.85-2.25	Test Distance (m)	10

COMMENTS

None

EUT OPERATING MODES

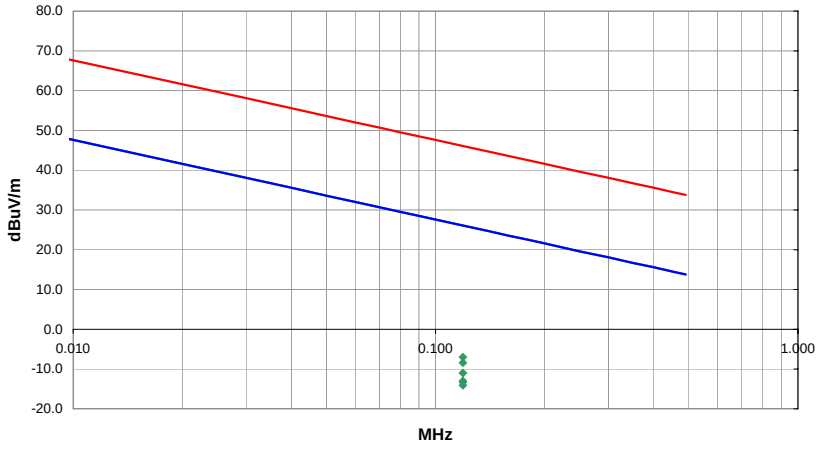
Tag Inventory

DEVIATIONS FROM TEST STANDARD

No deviations.

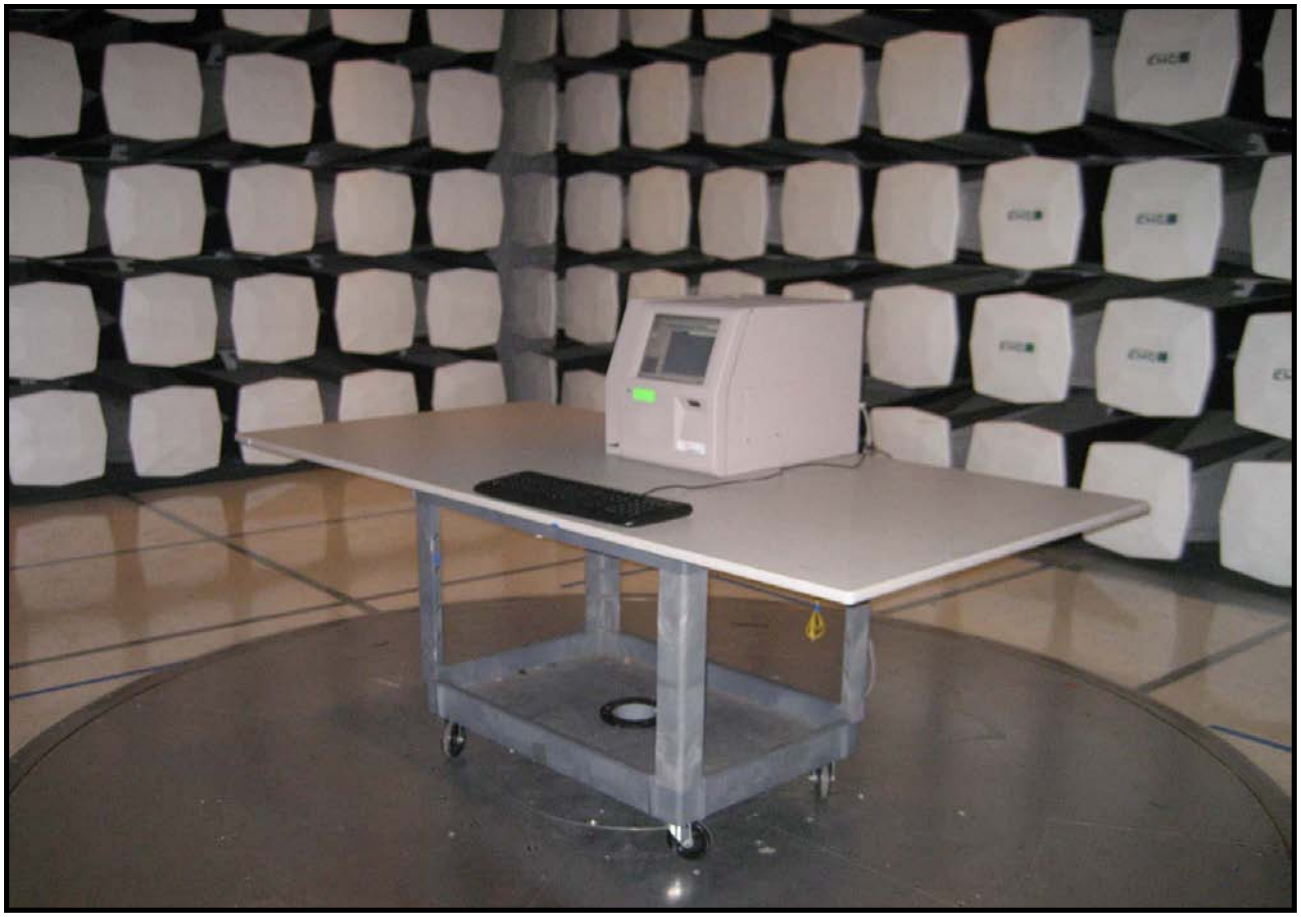
Run #	1
Configuration #	1
Results	Pass

Signature



Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Azimuth (degrees)	Height (meters)	Distance (meters)	External Attenuation (dB)	Polarity	Detector	Distance Adjustment (dB)	Adjusted dBuV/m	Spec. Limit dBuV/m	Compared to Spec. (dB)	Comments
0.119	39.9	10.8	273.0	1.9	10.0	0.0	oop/Active I	AV	-59.1	-8.4	26.1	-34.5	Antenna perpendicular to the ground and perpendicular to the EUT
0.119	35.0	10.8	196.0	1.9	10.0	0.0	oop/Active I	AV	-59.1	-13.3	26.1	-39.4	Antenna perpendicular to the ground and parallel to the EUT
0.119	34.2	10.8	41.0	2.0	10.0	0.0	oop/Active I	AV	-59.1	-14.1	26.1	-40.2	Antenna parallel to ground and perpendicular to the EUT
0.119	41.3	10.8	273.0	1.9	10.0	0.0	oop/Active I	PK	-59.1	-7.0	46.1	-53.1	Antenna perpendicular to the ground and perpendicular to the EUT
0.119	37.3	10.8	195.0	1.9	10.0	0.0	oop/Active I	PK	-59.1	-11.0	46.1	-57.1	Antenna perpendicular to the ground and parallel to the EUT
0.119	35.3	10.8	41.0	2.0	10.0	0.0	oop/Active I	PK	-59.1	-13.0	46.1	-59.1	Antenna parallel to ground and perpendicular to the EUT

FIELD STRENGTH OF FUNDAMENTAL



SPURIOUS RADIATED 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

Tag Inventory

MODE USED FOR FINAL DATA

Tag Inventory

POWER SETTINGS INVESTIGATED

120VAC/60Hz

POWER SETTINGS USED FOR FINAL DATA

120VAC/60Hz

FREQUENCY RANGE INVESTIGATED

Start Frequency	10 KHz	Stop Frequency	30 MHz

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
Antenna, Loop	EMCO	6502	AZB	12/2/2006	24
OC08 Cables	None	30MHz-6GHz RE Cables	OCB	2/1/2008	13
Spectrum Analyzer	Agilent	E4443A	AAR	12/14/2007	13

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

Measurement uncertainty is used to reflect the accuracy of the measured result as compared with its "true" or theoretically correct value. Our measurement data meets or exceeds the measurement uncertainty requirements of CISPR 16-4. In the case of transient tests our test equipment has been demonstrated by calibration to provide at least a 95% confidence that it complies with the test specification requirements. The measurement uncertainty for any test is available upon request.

TEST DESCRIPTION

The antennas to be used with the EUT were tested. The EUT was transmitting and/or receiving while set at the one channel available. While scanning, emissions from the EUT were maximized by rotating the EUT, adjusting the measurement antenna height and polarization, and manipulating the EUT antenna in 3 orthogonal planes if applicable (per ANSI C63.4:2003).

As specified in 47 CFR 15.31, due to the low level emissions measurments were made at an EUT to antenna distance of 10 meters. As specified for measuremests below 30 MHz, the data was then corrected by using the square of an inverse linear distance extrapolation factor (40 dB/decade)

NORTHWEST EMC

SPURIOUS RADIATED EMISSIONS

PSA 2007.05.07
EMI 2008.1.9

EUT:	Tag Associator			Work Order:	CRDN0216
Serial Number:	6			Date:	11/05/08
Customer:	Cardinal Health			Temperature:	21C
Attendees:	Jim Owen			Humidity:	44%
Project:	None			Barometric Pres.:	1018 mb
Tested by:	Jaemi Suh	Power:	120VAC/60Hz	Job Site:	OC08

TEST SPECIFICATIONS	Test Method
FCC 15.209:2008	ANSI C63.4:2003

TEST PARAMETERS			
Antenna Height(s) (m)	1 - 4	Test Distance (m)	10

COMMENTS

None

EUT OPERATING MODES

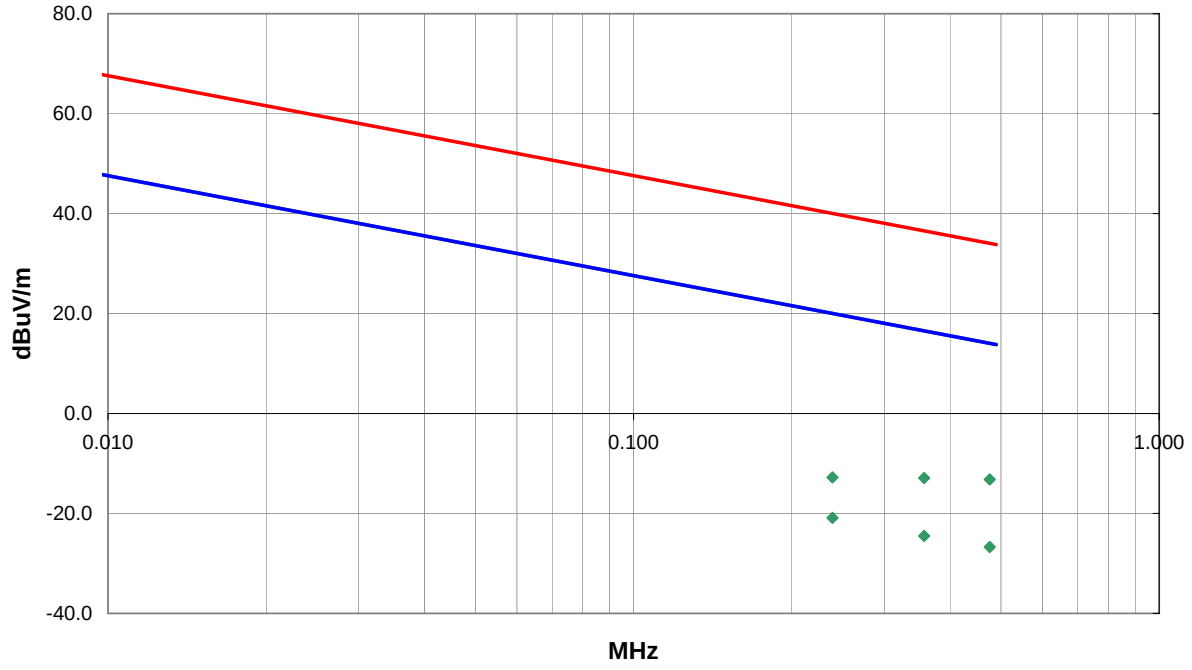
Tag Inventory

DEVIATIONS FROM TEST STANDARD

No deviations.

Run #	2
Configuration #	1
Results	Pass

Signature



Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Azimuth (degrees)	Height (meters)	Distance (meters)	External Attenuation (dB)	Polarity	Detector	Distance Adjustment (dB)	Adjusted dBuV/m	Spec. Limit dBuV/m	Compared to Spec. (dB)
0.476	21.8	10.6	259.0	2.2	10.0	0.0	oop/Active I	AV	-59.1	-26.7	14.0	-40.7
0.239	27.7	10.5	146.0	1.9	10.0	0.0	oop/Active I	AV	-59.1	-20.9	20.0	-40.9
0.357	24.0	10.6	267.0	1.9	10.0	0.0	oop/Active I	AV	-59.1	-24.5	16.5	-41.0
0.476	35.3	10.6	259.0	2.2	10.0	0.0	oop/Active I	PK	-59.1	-13.2	34.0	-47.2
0.357	35.6	10.6	267.0	1.9	10.0	0.0	oop/Active I	PK	-59.1	-12.9	36.5	-49.4
0.239	35.8	10.5	146.0	1.9	10.0	0.0	oop/Active I	PK	-59.1	-12.8	40.0	-52.8

NORTHWEST EMC

SPURIOUS RADIATED EMISSIONS

PSA 2007.05.07
EMI 2008.1.9

EUT:	Tag Associator			Work Order:	CRDN0216
Serial Number:	6			Date:	11/05/08
Customer:	Cardinal Health			Temperature:	21C
Attendees:	Jim Owen			Humidity:	44%
Project:	None			Barometric Pres.:	1018 mb
Tested by:	Jaemi Suh	Power:	120VAC/60Hz	Job Site:	OC08

TEST SPECIFICATIONS	Test Method
FCC 15.209:2008	ANSI C63.4:2003

TEST PARAMETERS			
Antenna Height(s) (m)	1 - 4	Test Distance (m)	10

COMMENTS

None

EUT OPERATING MODES

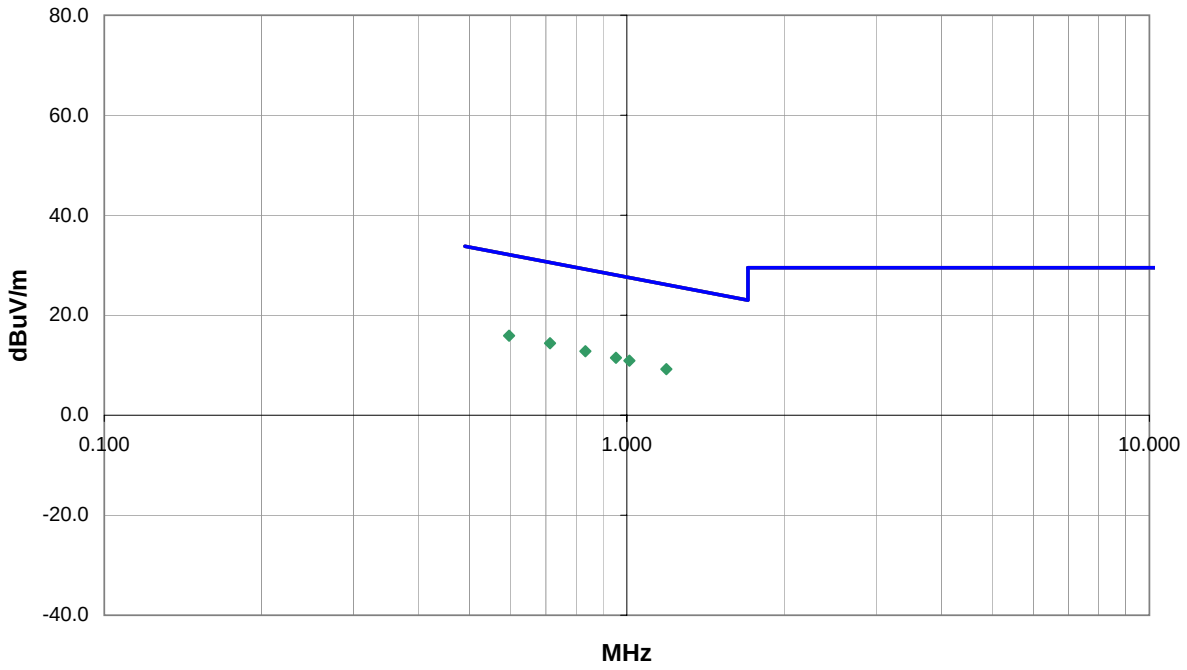
Tag Inventory

DEVIATIONS FROM TEST STANDARD

No deviations.

Run #	2
Configuration #	1
Results	Pass

Signature



Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Azimuth (degrees)	Height (meters)	Distance (meters)	External Attenuation (dB)	Polarity	Detector	Distance Adjustment (dB)	Adjusted dBuV/m	Spec. Limit dBuV/m	Compared to Spec. (dB)
0.713	23.0	10.5	32.0	1.0	10.0	0.0	oop/Active I	QP	-19.1	14.4	30.5	-16.1
0.595	24.6	10.4	256.0	1.0	10.0	0.0	oop/Active I	QP	-19.1	15.9	32.1	-16.2
0.833	21.4	10.5	152.0	1.0	10.0	0.0	oop/Active I	QP	-19.1	12.8	29.2	-16.4
0.953	20.0	10.6	106.0	1.0	10.0	0.0	oop/Active I	QP	-19.1	11.5	28.0	-16.5
1.011	19.4	10.6	0.0	1.0	10.0	0.0	oop/Active I	QP	-19.1	10.9	27.5	-16.6
1.190	17.7	10.6	3.0	1.0	10.0	0.0	oop/Active I	QP	-19.1	9.2	26.1	-16.9

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

Radio On

POWER SETTINGS INVESTIGATED

120V/60Hz

CONFIGURATIONS INVESTIGATED

CRDN0259 - 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
OC06 Cables	None	CE Cables	OCM	1/10/2008	13 mo
LISN	Solar	9252-50-R-24-BNC	LIC	2/6/2008	13 mo
Receiver	Rohde & Schwarz	ESCI	ARF	12/14/2007	13 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

Measurement uncertainty is used to reflect the accuracy of the measured result as compared with its "true" or theoretically correct value. Our measurement data meets or exceeds the measurement uncertainty requirements of CISPR 16-4. In the case of transient tests our test equipment has been demonstrated by calibration to provide at least a 95% confidence that it complies with the test specification requirements. The measurement uncertainty for any test is 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.

NORTHWEST

EMC

AC POWERLINE CONDUCTED EMISSIONS

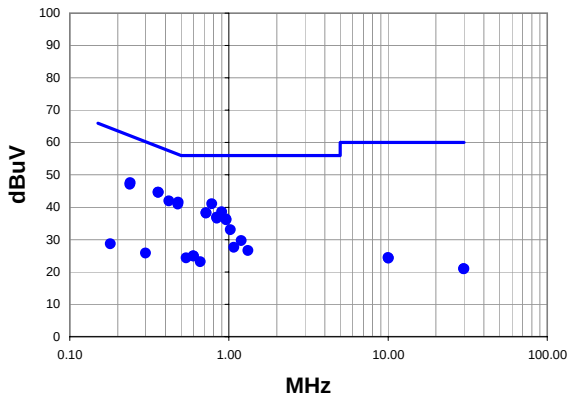
PSA-ESCI 2008.07.07
Version 2008.7.14

Work Order:	CRDN0259	**Date:**	12/08/08		
Project:	None	**Temperature:**	22 °C		
Job Site:	OC06	**Humidity:**	44		
Serial Number:	006	**Barometric Pres.:**	1016 mb	**Tested by:**	Jeremiah Darden
EUT:	Tag Associator				
Configuration:	1				
Customer:	Cardinal Health				
Attendees:	Jim Owen				
EUT Power:	120V/60Hz				
Operating Mode:	Radio On				
Deviations:	No deviations				
Comments:	None				

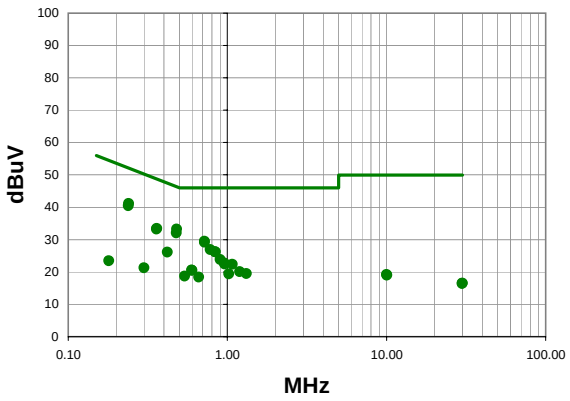
Test Specifications	**Test Method**
FCC 15.207:2008	ANSI C63.4:2003

Run #	1	**Line:**	High Line	**Ext. Attenuation:**	20	**Results**	Pass

Quasi Peak Data - vs - Quasi Peak Limit



Average Data - vs - Average Limit



Quasi Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Compared to Spec. (dB)
0.360	23.6	21.1	44.7	58.5	-13.8
0.359	23.6	21.1	44.7	58.5	-13.9
0.240	26.4	21.2	47.6	62.1	-14.5
0.480	20.6	20.9	41.5	56.3	-14.8
0.780	20.4	20.7	41.1	56.0	-14.9
0.239	25.9	21.2	47.1	62.1	-15.1
0.479	20.0	20.9	40.9	56.4	-15.4
0.420	20.9	21.0	41.9	57.7	-15.8
0.900	18.0	20.6	38.6	56.0	-17.4
0.720	17.5	20.7	38.2	56.0	-17.8
0.718	17.4	20.7	38.1	56.0	-17.9
0.838	16.3	20.6	36.9	56.0	-19.1
0.840	16.0	20.6	36.6	56.0	-19.4
0.958	15.9	20.5	36.4	56.0	-19.6
0.960	15.6	20.5	36.1	56.0	-19.9
1.020	12.5	20.5	33.0	56.0	-23.0
1.197	9.2	20.5	29.7	56.0	-26.3
1.077	7.1	20.5	27.6	56.0	-28.4
1.317	6.1	20.5	26.6	56.0	-29.4
0.598	4.1	20.9	25.0	56.0	-31.1

Average Data - vs - Average Limit

Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Compared to Spec. (dB)
0.240	20.0	21.2	41.2	52.1	-10.9
0.239	19.3	21.2	40.5	52.1	-11.7
0.480	12.3	20.9	33.2	46.3	-13.1
0.479	11.1	20.9	32.0	46.4	-14.3
0.360	12.4	21.1	33.5	48.5	-15.0
0.359	12.2	21.1	33.3	48.5	-15.3
0.718	8.7	20.7	29.4	46.0	-16.6
0.720	8.4	20.7	29.1	46.0	-16.9
0.780	6.2	20.7	26.9	46.0	-19.1
0.840	5.6	20.6	26.2	46.0	-19.8
0.838	5.6	20.6	26.2	46.0	-19.8
0.420	5.1	21.0	26.1	47.7	-21.6
0.900	3.3	20.6	23.9	46.0	-22.1
0.958	2.2	20.5	22.7	46.0	-23.3
0.960	1.9	20.5	22.4	46.0	-23.6
1.077	1.9	20.5	22.4	46.0	-23.6
0.598	-0.3	20.8	20.5	46.0	-25.5
0.600	-0.4	20.9	20.5	46.0	-25.6
1.197	-0.4	20.5	20.1	46.0	-25.9
1.317	-1.0	20.5	19.5	46.0	-26.5

NORTHWEST

EMC

AC POWERLINE CONDUCTED EMISSIONS

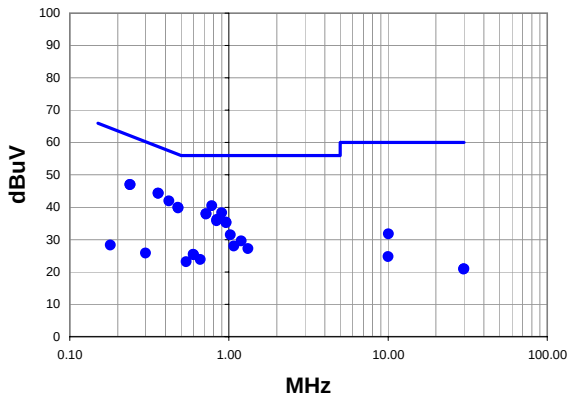
PSA-ESCI 2008.07.07
Version 2008.7.14

Work Order:	CRDN0259	**Date:**	12/08/08		
Project:	None	**Temperature:**	22 °C		
Job Site:	OC06	**Humidity:**	44		
Serial Number:	006	**Barometric Pres.:**	1016 mb	**Tested by:**	Jeremiah Darden
EUT:	Tag Associator				
Configuration:	1				
Customer:	Cardinal Health				
Attendees:	Jim Owen				
EUT Power:	120V/60Hz				
Operating Mode:	Radio On				
Deviations:	No deviations				
Comments:	None				

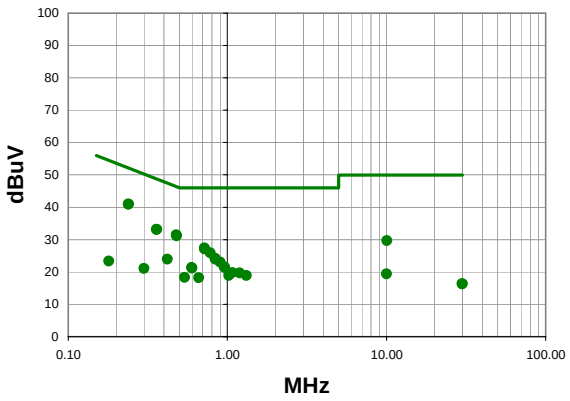
Test Specifications	**Test Method**
FCC 15.207:2008	ANSI C63.4:2003

Run #	3	**Line:**	Neutral	**Ext. Attenuation:**	20	**Results**	Pass

Quasi Peak Data - vs - Quasi Peak Limit



Average Data - vs - Average Limit

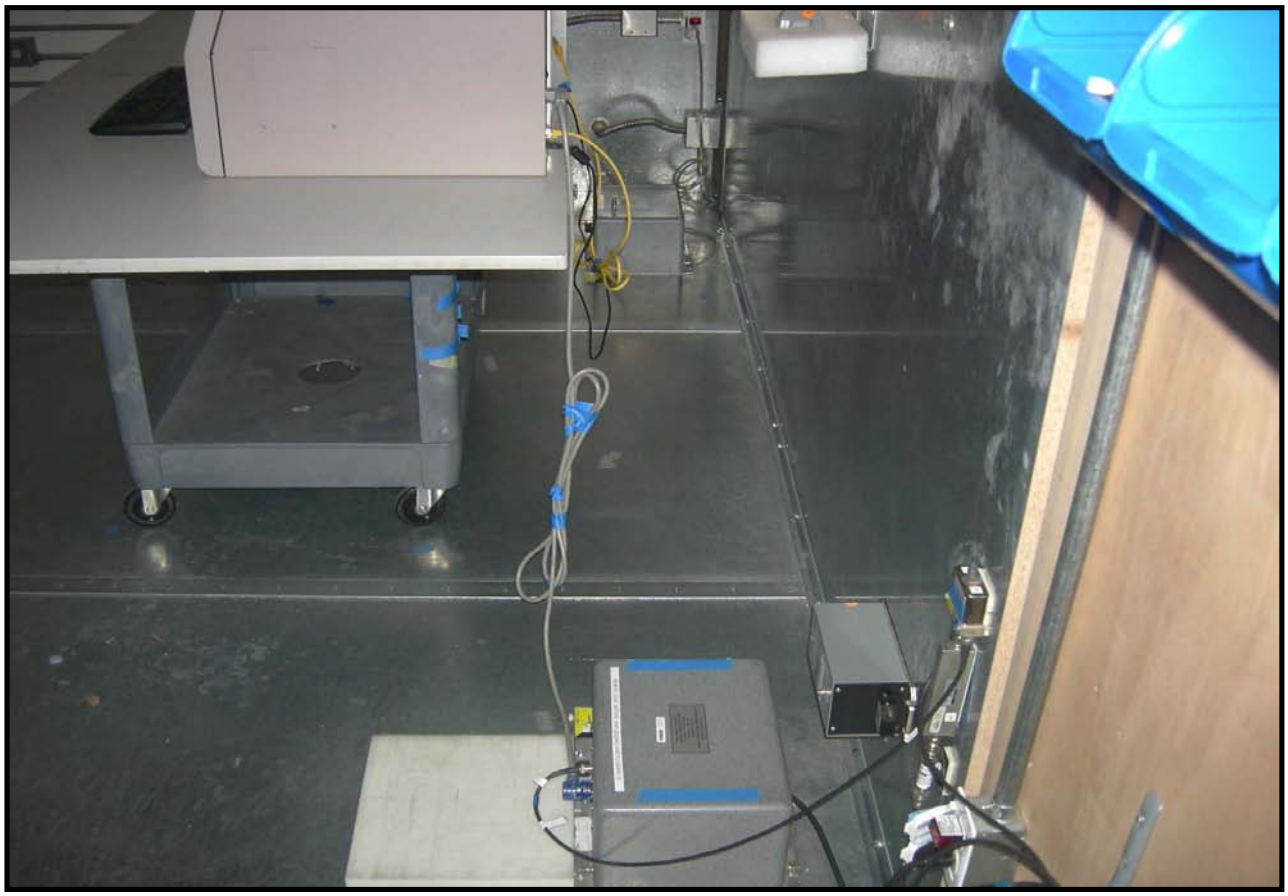


Quasi Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Compared to Spec. (dB)
0.359	23.3	21.1	44.4	58.6	-14.2
0.360	23.3	21.1	44.4	58.6	-14.3
0.240	25.8	21.2	47.0	62.1	-15.1
0.239	25.8	21.2	47.0	62.1	-15.2
0.780	19.8	20.7	40.5	56.0	-15.5
0.420	20.9	21.0	41.9	57.7	-15.8
0.479	19.0	20.9	39.9	56.4	-16.4
0.480	18.8	20.9	39.7	56.3	-16.6
0.900	17.7	20.6	38.3	56.0	-17.7
0.720	17.2	20.7	37.9	56.0	-18.1
0.718	17.1	20.7	37.8	56.0	-18.2
0.840	15.6	20.6	36.2	56.0	-19.8
0.838	15.2	20.6	35.8	56.0	-20.2
0.958	14.9	20.5	35.4	56.0	-20.6
0.960	14.7	20.5	35.2	56.0	-20.8
1.020	11.0	20.5	31.5	56.0	-24.5
1.197	9.1	20.5	29.6	56.0	-26.4
1.077	7.5	20.5	28.0	56.0	-28.0
10.054	10.9	20.8	31.7	60.0	-28.3
1.317	6.7	20.5	27.2	56.0	-28.8

Average Data - vs - Average Limit

Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Compared to Spec. (dB)
0.240	19.8	21.2	41.0	52.1	-11.1
0.239	19.8	21.2	41.0	52.1	-11.2
0.479	10.5	20.9	31.4	46.4	-14.9
0.480	10.2	20.9	31.1	46.3	-15.2
0.360	12.1	21.1	33.2	48.6	-15.4
0.359	12.1	21.1	33.2	48.6	-15.5
0.720	6.7	20.7	27.4	46.0	-18.6
0.718	6.4	20.7	27.1	46.0	-18.9
0.780	5.2	20.7	25.9	46.0	-20.1
10.054	8.8	20.8	29.6	50.0	-20.4
0.838	3.6	20.6	24.2	46.0	-21.8
0.840	3.3	20.6	23.9	46.0	-22.1
0.900	2.5	20.6	23.1	46.0	-22.9
0.420	2.9	21.0	23.9	47.7	-23.8
0.958	0.9	20.5	21.4	46.0	-24.6
0.960	0.9	20.5	21.4	46.0	-24.6
0.598	0.5	20.9	21.4	46.0	-24.6
0.600	0.3	20.9	21.2	46.0	-24.9
1.077	-0.7	20.5	19.8	46.0	-26.2
1.197	-0.8	20.5	19.7	46.0	-26.3



RADIATED 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
Tag Inventory

POWER SETTINGS INVESTIGATED
120V/60Hz

CONFIGURATIONS INVESTIGATED
CRDN0216 - 1

FREQUENCY RANGE INVESTIGATED			
Start Frequency	30 MHz	Stop Frequency	1000 MHz

CLOCKS AND OSCILLATORS
None Provided

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
Antenna, Biconilog	EMCO	3142	AXK	2/25/2008	24 mo
OC08 Cables	None	30MHz-6GHz RE Cables	OCB	2/1/2008	13 mo
Pre-Amplifier	Miteq	AM-1551	AOX	2/1/2008	13 mo
Spectrum Analyzer	Agilent	E4443A	AAR	12/14/2007	13 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

Measurement uncertainty is used to reflect the accuracy of the measured result as compared with its "true" or theoretically correct value. Our measurement data meets or exceeds the measurement uncertainty requirements of CISPR 16-4. In the case of transient tests our test equipment has been demonstrated by calibration to provide at least a 95% confidence that it complies with the test specification requirements. The measurement uncertainty for any test is available upon request.

TEST DESCRIPTION

Using the mode of operation and configuration noted within this report, a final radiated emissions test was performed. The frequency range investigated (scanned), is also noted in this report. Radiated emissions measurements were made at the EUT azimuth and antenna height such that the maximum radiated emissions level will be detected. This requires the use of a turntable and an antenna positioner. The preferred method of a continuous azimuth search is utilized for frequency scans of the EUT field strength with both polarities of the measuring antenna. A calibrated, linearly polarized antenna was positioned at the specified distance from the periphery of the EUT.

Tests were made with the antenna positioned in both the horizontal and vertical planes of polarization. The antenna was varied in height above the conducting ground plane to obtain the maximum signal strength. Though specified in the report, the measurement distance shall be 3 meters or 10 meters. At any measurement distance, the antenna height was varied from 1 meter to 4 meters.

If measurements above 1 GHz were required, the test setup was modified to meet the regulatory requirements for higher frequency measurements. RF absorber was placed on the floor between the measurement antenna and EUT. Measurements were made at a 3 meter test distance with the EUT placed on a 0.8 meter high table. The level of emissions was maximized by varying the measurement antenna height from 1 to 4 meters, and rotating the turntable from 0 to 359 degrees. Both CISPR peak and average measurement detectors were used for comparison of the emissions to the peak and average specification limits.

NORTHWEST

EMC

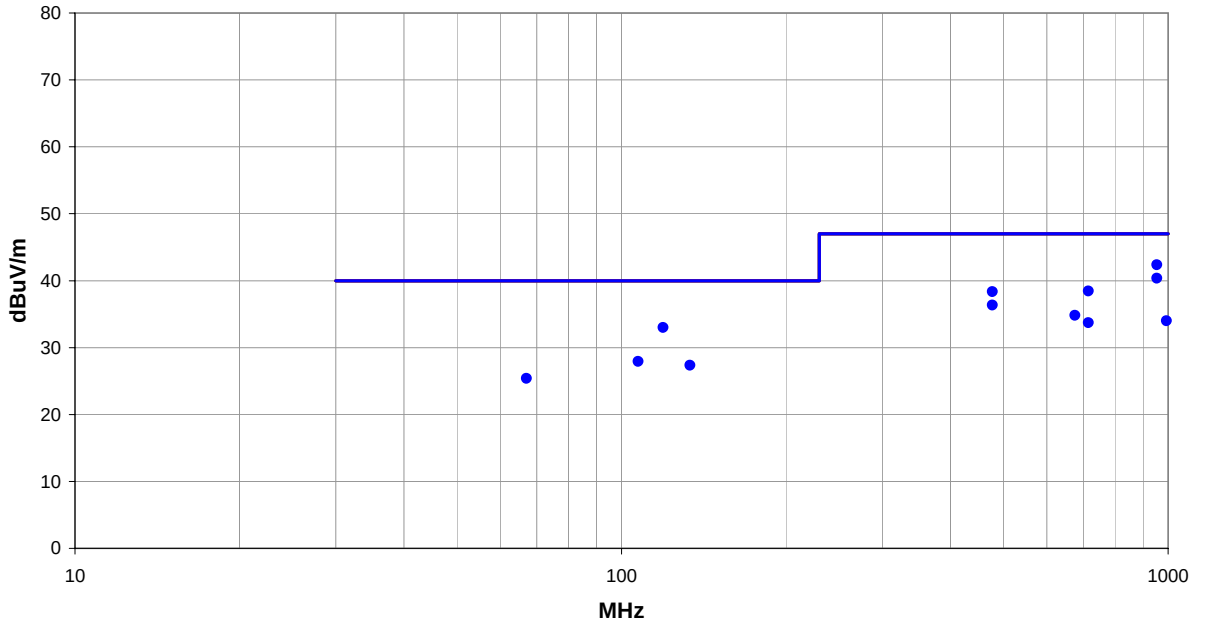
RADIATED EMISSIONS

PSA-ESCI 2008.07.07
Version 2008.7.14

Work Order:	CRDN0216	**Date:**	11/11/08		
Project:	None	**Temperature:**	21 °C		
Job Site:	OC08	**Humidity:**	44		
Serial Number:	6	**Barometric Pres.:**	1018 mb	**Tested by:**	Mark Baytan
EUT:	Tag Associator				
Configuration:	1				
Customer:	Cardinal Health				
Attendees:	Jim Owen				
EUT Power:	120V/60Hz				
Operating Mode:	Tag Inventory				
Deviations:	No Deviations				
Comments:	Redressed USB cables. Keyboard configured to worst case.				

Test Specifications	**Class A**	**Test Method**
IEC 60601-1-2:2007		CISPR 11:2004 (Amended by A2:2006)

Run #	4	**Test Distance (m)**	10	**Antenna Height(s)**	1-4m	**Results**	Pass



Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Test Distance (dB)	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)
953.567	50.8	-8.4	3.5	337.0	10.0	0.0	Horz	QP	0.0	42.4	47.0	-4.6
953.652	48.8	-8.4	1.6	360.0	10.0	0.0	Vert	QP	0.0	40.4	47.0	-6.6
119.202	60.3	-27.3	1.1	7.0	10.0	0.0	Vert	QP	0.0	33.0	40.0	-7.0
715.221	49.6	-11.2	2.0	0.0	10.0	0.0	Vert	QP	0.0	38.4	47.0	-8.6
476.829	53.2	-14.8	1.5	215.0	10.0	0.0	Horz	QP	0.0	38.4	47.0	-8.6
476.819	51.2	-14.8	2.5	121.0	10.0	0.0	Vert	QP	0.0	36.4	47.0	-10.6
107.315	54.6	-26.7	1.1	341.0	10.0	0.0	Vert	QP	0.0	27.9	40.0	-12.1
675.490	46.3	-11.5	2.0	360.0	10.0	0.0	Vert	QP	0.0	34.8	47.0	-12.2
133.528	54.4	-27.1	1.0	335.0	10.0	0.0	Vert	QP	0.0	27.3	40.0	-12.7
993.264	42.1	-8.1	1.0	11.0	10.0	0.0	Horz	QP	0.0	34.0	47.0	-13.0
715.189	44.9	-11.2	1.0	74.0	10.0	0.0	Horz	QP	0.0	33.7	47.0	-13.3
67.048	53.3	-27.9	3.3	322.0	10.0	0.0	Vert	QP	0.0	25.4	40.0	-14.6


EMC