Digital Control, Inc.

Model: DT
Model: DX

EMC Test Report

Report No. DIGC0129

Report Prepared By

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: January 04, 2011
Digital Control, Inc.
Model: DT, DX

Emissions			
Test Description	**Specification**	**Test Method**	**Pass/Fail**
Field Strength of Fundamental	FCC 15.209:2011	ANSI C63.10:2009	**Pass**
Field Strength of Spurious Emissions	FCC 15.209:2011	ANSI C63.10:2009	**Pass**

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

Test Facility

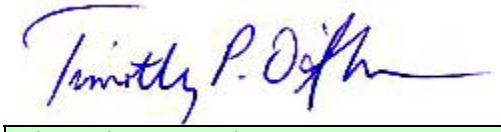
The measurement facility used to collect the data is located at:

Northwest EMC, Inc.
22975 NW Evergreen Parkway, Suite 400
Hillsboro, OR 97124

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 #2834D-1).

Approved By:



Tim O'Shea, Operations Manager

NVLAP Lab Code: 200630-0

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
00	None		

Barometric Pressure

The recorded barometric pressure has been normalized to sea level.

Accreditations and Authorizations

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 National Voluntary Laboratory Accreditation Program (NVLAP) for satisfactory compliance with the requirements of ISO/IEC 17025 for Testing Laboratories. NVLAP is administered by the National Institute of Standards and Technology (NIST), an agency of the U.S. Commerce Department. 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.

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, Brooklyn Park: 2834E-1)*

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.

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).

Accreditations and Authorizations

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, G-84, C-2687, T-1658, and R-2318, Irvine: R-1943, G-85, C-2766, and T-1659, Sultan: R-871, G-83, C-1784, and T-1511, Brooklyn Park: R-3125, G-86, G-141, C-3464, and T-1634).*

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).

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

KCC

Northwest EMC, Inc is a CAB designated by MRA partners and recognized by Korea. (*Assigned Lab Numbers: Hillsboro: US0017, Irvine: US0158, Sultan: US0157, Brooklyn Park: US0175)*

VIETNAM

Vietnam MIC has approved Northwest EMC as an accredited test lab. Per Decision No. 194/QD-QLCL (dated December 15, 2009), Northwest EMC test reports can be used for Vietnam approval submissions.

SCOPE

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

Northwest EMC Locations

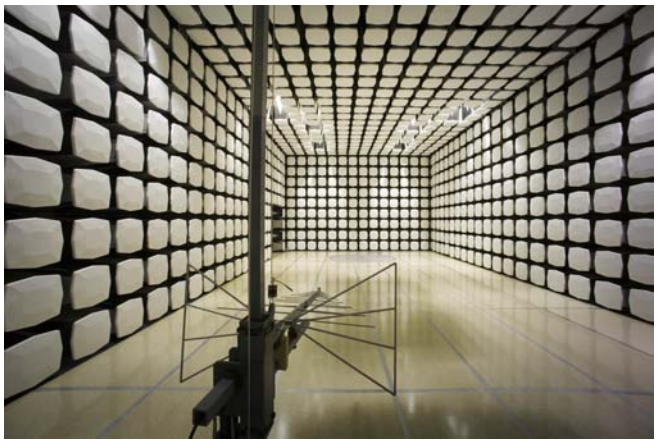
Oregon
Labs EV01-EV12
22975 NW Evergreen Pkwy
Suite 400
Hillsboro, OR 97124
(503) 844-4066

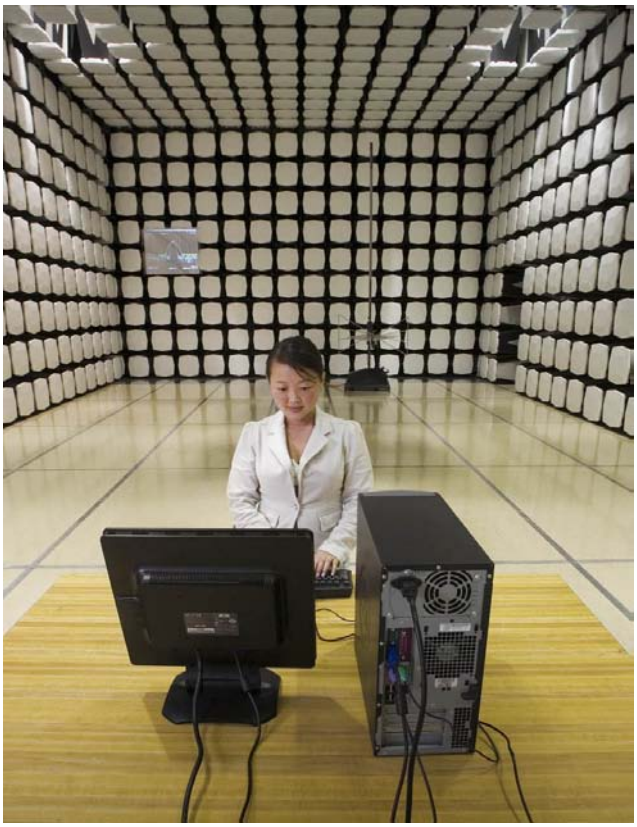
California
Labs OC01-OC13
41 Tesla
Irvine, CA 92618
(949) 861-8918

Minnesota
Labs MN01-MN08
9349 W Broadway Ave.
Brooklyn Park,
MN 55445
(763) 425-2281

Washington
Labs SU01-SU07
14128 339th Ave. SE
Sultan, WA 98294
(360) 793-8675

New York
Labs WA01-WA04
4939 Jordan Rd.
Elbridge, NY 13060
(315) 685-0796





Party Requesting the Test

Company Name:	Digital Control, Inc.
Address:	19625 62nd Avenue South, Suite B103
City, State, Zip:	Kent, WA 98032
Test Requested By:	Amanda Hamm
Models:	DT, DX
First Date of Test:	December 23, 2010
Last Date of Test:	January 4, 2011
Receipt Date of Samples:	December 23, 2010
Equipment Design Stage:	Production
Equipment Condition:	No Damage

Information Provided by the Party Requesting the Test

Functional Description of the EUT (Equipment Under Test):
33 kHz transmitter located in a HDD (or Horizontal Directional Drilling) Drill Head

Testing Objective:
To demonstrate compliance to FCC 15.209 requirements.

CONFIGURATION 1 DIGC0129

EUT			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Standard Unit	Digital Control, Inc.	DT	1226555

CONFIGURATION 2 DIGC0129

EUT			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Long Range Unit	Digital Control, Inc.	DX	1226569

Equipment modifications					
Item	Date	Test	Modification	Note	Disposition of EUT
1	12/23/2010	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	1/4/2011	Field Strength of Spurious Emissions	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	Scheduled testing was completed.

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

Default Transmit mode.

POWER SETTINGS INVESTIGATED

Internal Batteries

FREQUENCY RANGE INVESTIGATED

Start Frequency	9kHz	Stop Frequency	30MHz

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
Spectrum Analyzer	Agilent	E4443A	AFB	2/1/2010	12
EV11 Cables	N/A	3m Test Distance Cables	EVM	8/26/2010	13
Antenna, Loop	EMCO	6502	AZC	8/3/2009	24

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. Our measurement data meets or exceeds the measurement uncertainty requirements of CISPR 16-4. The measurement uncertainty estimation is available upon request.

TEST DESCRIPTION

The antenna to be used with the EUT was tested. The EUT was transmitting at the 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 (per ANSI C63.10:2009). An active loop antenna was used for this test in order to provide sufficient measurement sensitivity

NORTHWEST EMC

Field Strength of Fundamental

PSA 2008.07.21
EMI 2009.8.29

EUT:	DT	Work Order:	DIGC0129
Serial Number:	1226555	Date:	12/23/10
Customer:	Digital Control, Inc.	Temperature:	22.9 °C
Attendees:	None	Humidity:	31%
Project:	None	Barometric Pres.:	1015.7 mb
Tested by:	Dan Haas	Power: Internal Batteries	Job Site: EV11

TEST SPECIFICATIONS	Test Method
FCC 15.209:2010	ANSI C63.10:2009

TEST PARAMETERS			
Antenna Height(s) (m)	1.85 - 2.5	Test Distance (m)	3

COMMENTS

See notes for EUT and antenna orientation.

EUT OPERATING MODES

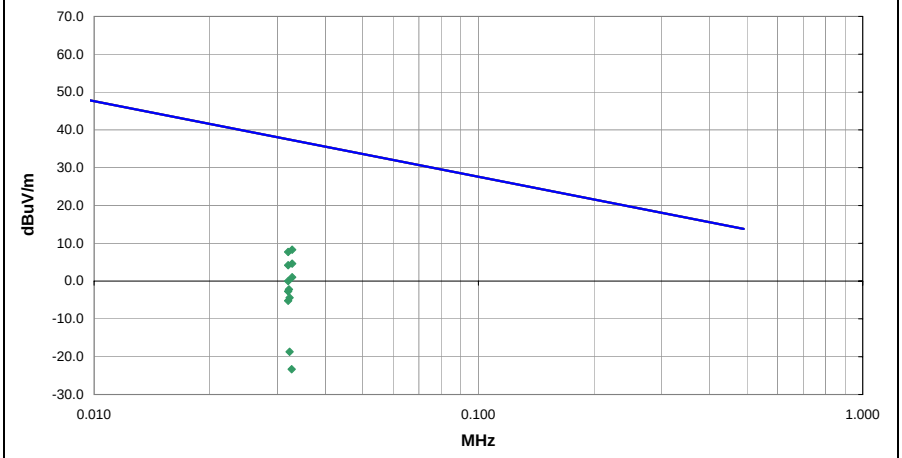
Default Transmit mode.

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
0.032	73.9	13.8	84.0	1.9	3.0	0.0	See Comment	AV	-80.0	7.7	37.5	-29.8	EUT horizontal, antenna para to EUT / perp to GND plane.
0.032	70.4	13.8	357.0	1.9	3.0	0.0	See Comment	AV	-80.0	4.2	37.5	-33.3	EUT horizontal, antenna perp to EUT / perp to GND plane.
0.032	66.2	13.8	76.0	1.8	3.0	0.0	See Comment	AV	-80.0	0.0	37.5	-37.5	EUT vertical, antenna perp to EUT / para to GND plane.
0.032	63.5	13.8	41.0	2.2	3.0	0.0	See Comment	AV	-80.0	-2.7	37.5	-40.2	EUT horizontal, antenna perp to EUT / para to GND plane.
0.032	61.0	13.8	127.0	1.9	3.0	0.0	See Comment	AV	-80.0	-5.2	37.5	-42.7	EUT vertical, antenna para to EUT / perp to GND plane.
0.033	74.5	13.8	84.0	1.9	3.0	0.0	See Comment	PK	-80.0	8.3	37.2	-28.9	EUT horizontal, antenna para to EUT / perp to GND plane.
0.033	70.8	13.8	357.0	1.9	3.0	0.0	See Comment	PK	-80.0	4.6	37.2	-32.6	EUT horizontal, antenna perp to EUT / perp to GND plane.
0.033	67.2	13.8	76.0	1.9	3.0	0.0	See Comment	PK	-80.0	1.0	37.2	-36.2	EUT vertical, antenna perp to EUT / para to GND plane.
0.032	64.0	13.8	41.0	2.2	3.0	0.0	See Comment	PK	-80.0	-2.2	37.5	-39.7	EUT horizontal, antenna perp to EUT / para to GND plane.
0.033	42.9	13.8	73.0	1.9	3.0	0.0	See Comment	AV	-80.0	-23.3	37.2	-60.5	EUT vertical, antenna perp to EUT / perp to GND plane.
0.032	61.8	13.8	127.0	1.9	3.0	0.0	See Comment	PK	-80.0	-4.4	37.5	-41.9	EUT vertical, antenna para to EUT / perp to GND plane.
0.032	47.5	13.8	73.0	1.9	3.0	0.0	See Comment	PK	-80.0	-18.7	37.5	-56.2	EUT vertical, antenna perp to EUT / perp to GND plane.

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

Default Transmit mode.

POWER SETTINGS INVESTIGATED

Internal Batteries

FREQUENCY RANGE INVESTIGATED

Start Frequency	9kHz	Stop Frequency	30MHz

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
Spectrum Analyzer	Agilent	E4443A	AFB	2/1/2010	12
EV11 Cables	N/A	3m Test Distance Cables	EVM	8/26/2010	13
Antenna, Loop	EMCO	6502	AZC	8/3/2009	24

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. Our measurement data meets or exceeds the measurement uncertainty requirements of CISPR 16-4. The measurement uncertainty estimation is available upon request.

TEST DESCRIPTION

The antenna to be used with the EUT was tested. The EUT was transmitting while set at the 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 (per ANSI C63.10:2009). An active loop antenna was used for this test in order to provide sufficient measurement sensitivity

NORTHWEST EMC

Field Strength of Fundamental

PSA 2008.07.21
EMI 2009.8.29

EUT:	DX	Work Order:	DIGC0129
Serial Number:	1226569	Date:	12/27/10
Customer:	Digital Control, Inc.	Temperature:	20.7 °C
Attendees:	none	Humidity:	35%
Project:	None	Barometric Pres.:	1022.6 mb
Tested by:	Dan Haas	Power: Internal Batteries	Job Site: EV11

TEST SPECIFICATIONS	Test Method
FCC 15.209:2010	ANSI C63.10:2009

TEST PARAMETERS			
Antenna Height(s) (m)	1.85 - 2.5	Test Distance (m)	3

COMMENTS

See notes for EUT and antenna orientation.

EUT OPERATING MODES

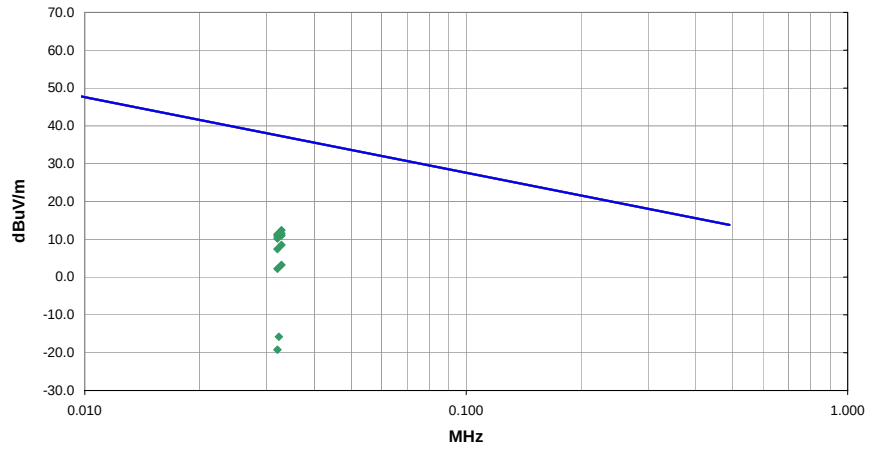
Default Transmit mode.

DEVIATIONS FROM TEST STANDARD

No deviations.

Run #	2
Configuration #	2
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
0.032	77.5	13.8	93.0	1.9	3.0	0.0	See Comment	AV	-80.0	11.3	37.5	-26.2	EUT horizontal, antenna para to EUT / perp to GND plane.
0.032	77.1	13.8	101.0	2.0	3.0	0.0	See Comment	AV	-80.0	10.9	37.5	-26.6	EUT horizontal, antenna perp to EUT / para to GND plane.
0.032	76.4	13.8	0.0	1.9	3.0	0.0	See Comment	AV	-80.0	10.2	37.5	-27.3	EUT horizontal, antenna perp to EUT / perp to GND plane.
0.032	73.6	13.8	185.0	1.9	3.0	0.0	See Comment	AV	-80.0	7.4	37.5	-30.1	EUT vertical, antenna perp to EUT / para to GND plane.
0.032	68.4	13.8	7.0	2.5	3.0	0.0	See Comment	AV	-80.0	2.2	37.5	-35.3	EUT vertical, antenna para to EUT / perp to GND plane.
0.033	78.6	13.8	93.0	1.9	3.0	0.0	See Comment	PK	-80.0	12.4	37.2	-24.8	EUT horizontal, antenna para to EUT / perp to GND plane.
0.033	77.7	13.8	101.0	2.0	3.0	0.0	See Comment	PK	-80.0	11.5	37.2	-25.7	EUT horizontal, antenna perp to EUT / para to GND plane.
0.033	77.2	13.8	0.0	1.9	3.0	0.0	See Comment	PK	-80.0	11.0	37.2	-26.2	EUT horizontal, antenna perp to EUT / perp to GND plane.
0.033	74.7	13.8	185.0	1.9	3.0	0.0	See Comment	PK	-80.0	8.5	37.2	-28.7	EUT vertical, antenna perp to EUT / para to GND plane.
0.033	69.4	13.8	7.0	2.5	3.0	0.0	See Comment	PK	-80.0	3.2	37.2	-34.0	EUT vertical, antenna para to EUT / perp to GND plane.
0.032	47.0	13.8	125.0	1.9	3.0	0.0	See Comment	AV	-80.0	-19.2	37.5	-56.7	EUT vertical, antenna perp to EUT / perp to GND plane.
0.032	50.4	13.8	125.0	1.9	3.0	0.0	See Comment	PK	-80.0	-15.8	37.5	-53.3	EUT vertical, antenna perp to EUT / perp to GND plane.

Field Strength of Spurious 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. The test data represents the configuration / operating mode/ model that produced the highest emission levels as compared to the specification limit.

MODES OF OPERATION

Default Transmit mode.

POWER SETTINGS INVESTIGATED

Internal Batteries

CONFIGURATIONS INVESTIGATED

DICG0129 - 1

FREQUENCY RANGE INVESTIGATED

Start Frequency	10 kHz	Stop Frequency	30 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
Spectrum Analyzer	Agilent	E4443A	AFB	2/1/2010	12 mo
Antenna, Loop	EMCO	6502	AZC	8/3/2009	24 mo
EV11 Cables	N/A	3m Test Distance Cables	EVM	8/26/2010	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 IF bandwidths and detectors specified. No video filter was used, except in the case of the FCC Average Measurements above 1GHz. In that case, a peak detector with a 10Hz video bandwidth 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

The antennas to be used with the EUT were tested. The EUT was transmitting and receiving while set at the channel available. While scanning, emissions from the EUT were maximized by rotating the EUT, adjusting the measurement antenna height and orientation in 3 orthogonal plane, and manipulating the EUT antenna in 3 orthogonal planes (per ANSI C63.4:2003). An active loop antenna was used for this test in order to provide sufficient measurement sensitivity.

NORTHWEST

EMC

Field Strength of Spurious Emissions

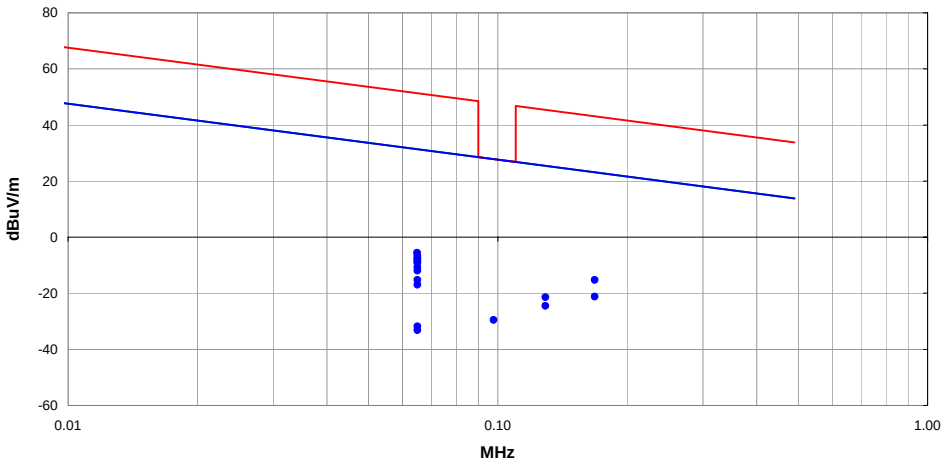
PSA-ESCI 2010.04.06
Version 2010.3.17

Work Order:	DIGC0129	**Date:**	01/04/11		
Project:	None	**Temperature:**	22.9 °C		
Job Site:	EV11	**Humidity:**	30.7		
Serial Number:	1226555	**Barometric Pres.:**	1015.7 mb	**Tested by:**	Rod Peloquin

EUT:	DT
Configuration:	1 - Standard Unit Configuration
Customer:	Digital Control, Inc.
Attendees:	none
EUT Power:	Internal Batteries
Operating Mode:	Default Transmit mode.
Deviations:	None
Comments:	See Comments for EUT and Antennna orientation

Test Specifications	**Test Method**
FCC 15.209:2010	ANSI C63.10:2009

Run #	13	**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
0.065	62.2	11.2	1.6	0.0	3.0	0.0	See Comments	AV	-80.0	-6.6	31.3	-37.9	EUT horizontal, Antenna parallel to EUT and perpendicular to ground plane
0.065	60.1	11.2	2.2	0.0	3.0	0.0	See Comments	AV	-80.0	-8.7	31.3	-40.0	EUT horizontal, Antenna perpendicular to EUT and parallel to ground plane
0.065	59.6	11.2	1.6	0.0	3.0	0.0	See Comments	AV	-80.0	-9.2	31.3	-40.5	EUT horizontal, Antenna perpendicular to EUT and perpendicular to ground plane
0.065	56.8	11.2	1.7	0.0	3.0	0.0	See Comments	AV	-80.0	-12.0	31.3	-43.3	EUT vertical, Antenna perpendicular to EUT and parallel to ground plane
0.168	48.0	10.8	1.3	0.0	3.0	0.0	See Comments	AV	-80.0	-21.2	23.1	-44.3	EUT horizontal, Antenna parallel to EUT and perpendicular to ground plane
0.065	51.8	11.2	2.7	0.0	3.0	0.0	See Comments	AV	-80.0	-17.0	31.3	-48.3	EUT vertical, Antenna parallel to EUT and perpendicular to ground plane
0.129	44.7	10.8	1.6	0.0	3.0	0.0	See Comments	AV	-80.0	-24.5	25.4	-49.9	EUT horizontal, Antenna parallel to EUT and perpendicular to ground plane
0.065	63.2	11.2	1.6	0.0	3.0	0.0	See Comments	PK	-80.0	-5.6	51.3	-56.9	EUT horizontal, Antenna parallel to EUT and perpendicular to ground plane
0.098	39.6	10.8	1.6	0.0	3.0	0.0	See Comments	AV	-80.0	-29.6	27.8	-57.4	EUT horizontal, Antenna parallel to EUT and perpendicular to ground plane
0.168	53.9	10.8	1.3	0.0	3.0	0.0	See Comments	PK	-80.0	-15.3	43.1	-58.4	EUT horizontal, Antenna parallel to EUT and perpendicular to ground plane
0.065	61.3	11.2	2.2	0.0	3.0	0.0	See Comments	PK	-80.0	-7.5	51.3	-58.8	EUT horizontal, Antenna perpendicular to EUT and parallel to ground plane
0.065	60.8	11.2	1.6	0.0	3.0	0.0	See Comments	PK	-80.0	-8.0	51.3	-59.3	EUT horizontal, Antenna perpendicular to EUT and perpendicular to ground plane
0.065	58.1	11.2	1.7	0.0	3.0	0.0	See Comments	PK	-80.0	-10.7	51.3	-62.0	EUT vertical, Antenna perpendicular to EUT and parallel to ground plane
0.065	35.6	11.2	1.6	0.0	3.0	0.0	See Comments	AV	-80.0	-33.2	31.3	-64.5	EUT vertical, Antenna perpendicular to EUT and perpendicular to ground plane
0.065	53.5	11.2	2.7	0.0	3.0	0.0	See Comments	PK	-80.0	-15.3	51.3	-66.6	EUT vertical, Antenna parallel to EUT and perpendicular to ground plane
0.129	47.8	10.8	1.6	0.0	3.0	0.0	See Comments	PK	-80.0	-21.4	45.4	-66.8	EUT horizontal, Antenna parallel to EUT and perpendicular to ground plane
0.065	37.0	11.2	1.6	0.0	3.0	0.0	See Comments	PK	-80.0	-31.8	51.3	-83.1	EUT vertical, Antenna perpendicular to EUT and perpendicular to ground plane

EMC Field Strength of Spurious 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. The test data represents the configuration / operating mode/ model that produced the highest emission levels as compared to the specification limit.

MODES OF OPERATION

Default Transmit mode.

POWER SETTINGS INVESTIGATED

Internal Batteries

CONFIGURATIONS INVESTIGATED

DIGC0129 - 2

FREQUENCY RANGE INVESTIGATED

Start Frequency	9 kHz	Stop Frequency	30 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
EV11 Cables	N/A	3m Test Distance Cables	EVM	8/26/2010	13 mo
Spectrum Analyzer	Agilent	E4443A	AFB	2/1/2010	12 mo
Antenna, Loop	EMCO	6502	AOA	7/1/2009	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

Measurements were made using the IF bandwidths and detectors specified. No video filter was used, except in the case of the FCC Average Measurements above 1GHz. In that case, a peak detector with a 10Hz video bandwidth 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

The highest gain of each type of antenna to be used with the EUT was tested. The EUT was configured for low, mid, and high band transmit frequencies. For each configuration, the spectrum was scanned throughout the specified range. In addition, measurements were made in the restricted bands to verify compliance. While scanning, emissions from the EUT were maximized by rotating the EUT on a turntable, adjusting the position of the EUT and the EUT antenna in three orthogonal axis, and adjusting measurement antenna height and polarization, and manipulating the EUT antenna in 3 orthogonal planes (per ANSI C63.10:2009). A preamp and high pass filter were used for this test in order to provide sufficient measurement sensitivity.

NORTHWEST EMC

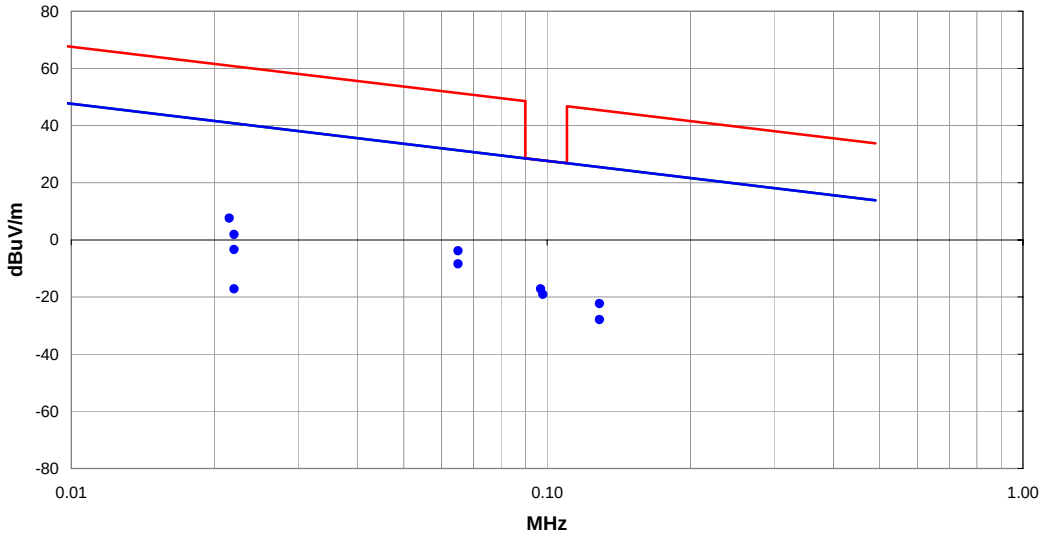
PSA-ESCI 2010.04.06
Version 2010.3.17

Field Strength of Spurious Emissions

Work Order:	DIGC0129	**Date:**	01/04/11	
Project:	None	**Temperature:**	22.9 °C	
Job Site:	EV11	**Humidity:**	30.7	
Serial Number:	1226569	**Barometric Pres.:**	1015.7 mb	**Tested by:** Travis Rychener
EUT:	DX			
Configuration:	2 - Long Range Unit Configuratior			
Customer:	Digital Control, Inc.			
Attendees:	none			
EUT Power:	Internal Batteries			
Operating Mode:	Default Transmit mode.			
Deviations:	None			
Comments:	See Comments			

Test Specifications	**Test Method**
FCC 15.209:2010	ANSI C63.10:2009

Run #	7	**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
0.022	67.8	14.0	1.6	0.0	3.0	0.0	See Comments	AV	-80.0	1.8	40.7	-38.9	EUT horizontal. Antenna perp, parallel to ground
0.065	60.3	11.2	1.6	0.0	3.0	0.0	See Comments	AV	-80.0	-8.5	31.3	-39.8	EUT horizontal. Antenna perp, parallel to ground
0.097	52.0	10.8	1.6	0.0	3.0	0.0	See Comments	QP	-80.0	-17.2	27.9	-45.0	EUT horizontal. Antenna perp, parallel to ground
0.098	50.1	10.8	1.8	0.0	3.0	0.0	See Comments	QP	-80.0	-19.1	27.8	-46.9	EUT horizontal. Antenna perp, parallel to ground
0.129	41.3	10.8	2.0	0.0	3.0	0.0	See Comments	AV	-80.0	-27.9	25.4	-53.3	EUT horizontal. Antenna perp, parallel to ground
0.022	73.5	14.1	1.6	0.0	3.0	0.0	See Comments	PK	-80.0	7.6	60.9	-53.4	EUT horizontal. Antenna perp, parallel to ground
0.065	64.9	11.2	1.6	0.0	3.0	0.0	See Comments	PK	-80.0	-3.9	51.3	-55.2	EUT horizontal. Antenna perp, parallel to ground
0.022	48.8	14.0	2.1	0.0	3.0	0.0	See Comments	AV	-80.0	-17.2	40.7	-57.9	EUT vertical. Antenna perp, parallel to ground
0.022	62.6	14.0	2.1	0.0	3.0	0.0	See Comments	PK	-80.0	-3.4	60.7	-64.1	EUT vertical. Antenna perp, parallel to ground
0.129	46.9	10.8	2.0	0.0	3.0	0.0	See Comments	PK	-80.0	-22.3	45.4	-67.7	EUT horizontal. Antenna perp, parallel to ground