



Test Report

Prepared for: Roboteq

Model: *See model list on page 6

Description: DC motor controller

Serial Number: N/A

To

FCC Part 15B
Class A

And

IC ICES-003 Issue 6 (January 2016)

Date of Issue: May 23, 2018

On the behalf of the applicant:

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Project Test Engineer

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All results contained herein relate only to the sample tested.

Test Report Revision History

Revision	Date	Revised By	Reason for Revision
1.0	5/22/18	Alex Macon	Original Document

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The applicant has been cautioned as to the following

FCC

15.21 – Information to user

The user's manual or instruction manual for an intentional radiator shall caution the user that changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

15.27(a) – Special Accessories

Equipment marketed to a consumer must be capable of complying with the necessary regulations in the configuration in which the equipment is marketed. Where special accessories such as shielded cables and/or special connectors are required to enable an unintentional or intentional radiator to comply with the emission limits in the part, the equipment must be marketed with, i.e. shipped and sold with, those special accessories. However, in lieu of shipping or packaging the special accessories with the unintentional or intentional radiator, the responsible party may employ other methods of ensuring that the special accessories are provided to the consumer without an additional charge.

Information detailing any alternative method used to supply the special accessories for a grant of equipment authorization or retained in the verification records, as appropriate. The party responsible for the equipment, as detailed in §2.909 of this chapter, shall ensure that these special accessories are provided with the equipment. The instruction manual for such devices shall include appropriate instructions on the first page of text concerned with the installation of the device that these special accessories must be used with the device. It is the responsibility of the user to use the needed special accessories supplied with the equipment.

Industry Canada

Products subject to Industry Canada ICES-003 must be labeled in English and/or French (based on the intended market and any other applicable provincial or federal regulations) as follows:

CAN ICES-3 A/NMB-3A

ILAC / A2LA

Compliance Testing, LLC, has been accredited in accordance with the recognized International Standard ISO/IEC 17025:2005. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to the joint ISO-ILAC-IAF Communiqué dated January 2009).

The tests results contained within this test report all fall within our scope of accreditation, unless noted below.

Please refer to <http://www.compliancetesting.com/labscope.html> for current scope of accreditation.

Testing Certificate Number: **2152.01**



FCC Site Reg. #349717

IC Site Reg. #2044A-2

Non-accredited tests contained in this report:

N/A

Test and Measurement Data

Subpart 2.1033(b)

All tests and measurement data shown were performed in accordance with FCC Rule Parts: 15.107, 15.109 (Unintentional Radiators).

All tests and measurement data shown are deemed satisfactory evidence of compliance with Industry Canada Interference-Causing Equipment Standard ICES-003.

Name of Test	FCC Section	ICES-003
A/C Powerline Conducted Emissions	15.107	Section 6
Radiated Emissions	15.109	Section 6

Standard Engineering Practices

Unless otherwise indicated, the procedures contained in ANSI C63.4-2014 were observed during testing.

Prior to testing, the EUT was tuned up in accordance with the manufacturer's alignment procedures. All external gain controls were maintained at the position of maximum and/or optimum gain throughout the testing.

Measurement results, unless otherwise noted, are worst case measurement.

Standard Test Conditions and Engineering Practices

Unless otherwise indicated in the specific measurement results, the ambient temperature was maintained within the range of 10° to 40°C (50° to 104°F) and the relative humidity levels were in the range of 10% to 90%.

Environmental Conditions	
Temperature (°C)	Humidity (%)
22.1 – 23.2	27.3 – 31.4

EUT Description

Model Tested: SBL1360A, SDC2160

Variant Models:

SDC2160/Brushed Family	SBL1360A/Brushless Family
MDC1460	SBL2360
SDC3260	SBL2396
FDC3260	MBL1660(A)
MDC2460	KBL1660
XDC2460	FBL2360
HDC2460	HBL1660
HDC2496	HBL1696
RGDC1860	HBL2360
RGDC1896	HBL2396
GDC2660	RGBL1860
GDC2696	RGBL1896
	GBL2660
	GBL2696

Description: DC motor controller

Firmware: N/A

Software: N/A

Serial Number: N/A

Additional Information: The manufacturer has completed preliminary testing to ascertain the worst case models for radiated emissions. Models SBL1360A and SDC2160 have been selected for radiated emissions testing. The highest internal clock frequency is 78MHz

EUT Operation During Tests

All devices were put into a test mode to alternate indicator LEDs to ensure proper operation. All devices were paired with a representative resistive load to enable full current draw.

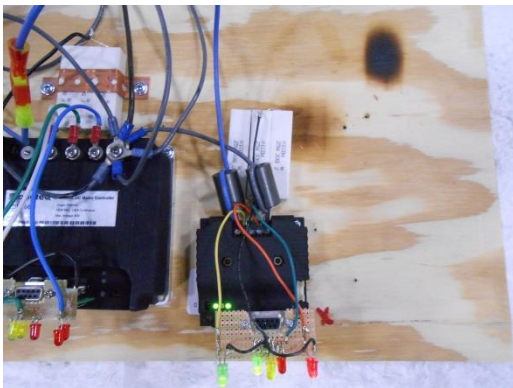
Accessories: None

Cables: None

Modifications:

Ferrites were added to the IO cables of the EUT in order to comply with radiated emissions testing

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Test Results Summary

Specification	Test Name	Pass, Fail, N/A	Comments
15.107	A/C Powerline Conducted Emissions	N/A	EUT is DC powered and does not connect to the AC mains
15.109	Radiated Emissions	Pass	

15.109 Radiated Emissions

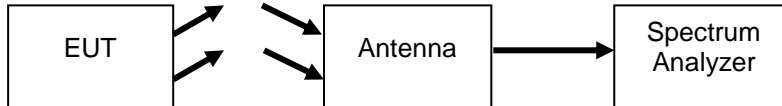
Engineer: Alex Macon

Test Date: 5/18/18

Test Procedure

The EUT was tested in a semi-anechoic chamber with the turntable set 3m from the receiving antenna. A spectrum analyzer was used to verify that the EUT met the requirements for Radiated Emissions. The EUT was tested by rotating it 360 degrees with the antennas in both the vertical and horizontal orientation while raised from 1 to 4 meters to ensure the signal levels were maximized. All emissions from 30 MHz to 1 GHz were examined.

Test Setup



Settings below 1 GHz

RBW = 120 KHz

VBW = 300 KHz

Detector – Quasi Peak

Settings above 1 GHz

RBW = 1 MHz

VBW = 3 MHz

Detector – Peak

Sample Calculations

Corrected Value = Measured Value + Correction factor

Correction factor = ACF + Cable loss

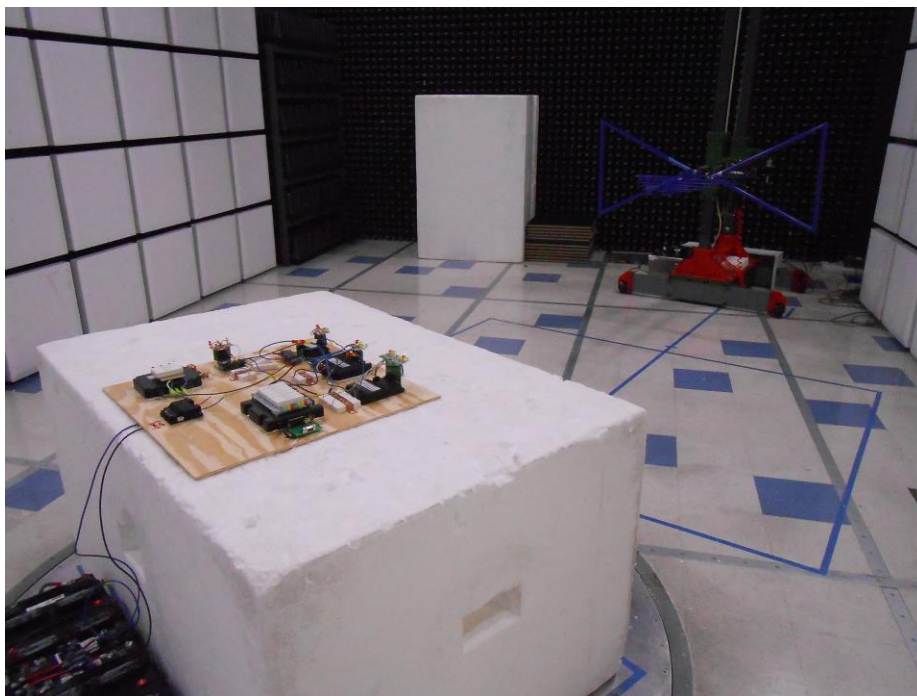
Radiated Emissions for SDC2160

Emission Frequency (MHz)	Measured Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Antenna Polarity (V/H)	Turntable Position (deg)	Detector (QP,PK,Avg)
30	46.03	49.5	-3.47	100	V	85	QP
61.99	40.17	49.5	-9.33	100	V	24	QP
90.31	29.94	54	-24.06	100	V	24	QP
120.149	39.26	54	-14.74	264	H	41	QP
128.524	40.11	54	-13.89	145	H	175	QP
385.797	41.04	56.9	-15.86	100	H	15	QP

Radiated Emissions for SBL1360A

Emission Frequency (MHz)	Measured Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Antenna Polarity (V/H)	Turntable Position (deg)	Detector (QP,PK,Avg)
30	30.41	49.5	-19.09	100	V	360	QP
62.45	31.84	49.5	-17.66	100	V	36	QP
75.77	28.94	49.5	-20.56	100	H	206	QP
95.49	28.64	54	-25.36	100	H	322	QP
100.935	31.88	54	-22.12	100	V	139	PK
1000.0	36.968	56.9	-19.93	250	V	336	PK

Radiated Emissions Test Setup Photos



Test Equipment Utilized

Description	Manufacturer	Model #	CT Asset #	Last Cal Date	Cal Due Date
Bi-Log Antenna	Schaffner	CBL 6111D	i00349	8/3/16	8/3/18
EMI Analyzer	Agilent	E7405A	i00379	2/13/18	2/13/19
3 Meter Semi-Anechoic Chamber	Panashield	3 Meter Semi-Anechoic Chamber	i00428	8/15/16	8/15/19

In addition to the above listed equipment standard RF connectors and cables were utilized in the testing of the described equipment. Prior to testing these components were tested to verify proper operation.

END OF TEST REPORT