

AHD

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EXHIBIT K PART 1 OF 2: REPORT OF MEASUREMENTS [2.1033(B6)]

Test Report for FCC ID: CB2VWHL3 **FCC Part 2.1031, Part 15 Subpart C(15.231)**

Report #20000373F
Issued 12/08/00



TRANSMITTER MODEL CB2VWHL3 OF HOMELINK® III SERIES

Prepared for:

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Johnson Controls Interiors, LLC
One Prince Center
Holland, MI 49423

Test Date(s): November 13,14,17,18, 2000

data recorded by



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witnessed by

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This report prepared by:



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Statements Concerning this Report

Test Traceability:

The calibration of all measuring and test equipment and the measured data using this equipment are traceable to the National Institute for Standards and Technology (NIST).

Limitations on results:

The test results contained in this report relate only to the Item(s) tested. Any electrical or mechanical modification made to the test item subsequent to the test date shall invalidate the data presented in this report. Any electrical or mechanical modification made to the test item subsequent to this test date shall require an evaluation to verify continued compliance.

Limitations on copying:

This report shall not be reproduced, except in full, without the written approval of AHD.

Limitations of the report:

This report shall not be used to claim product endorsement by NVLAP, FCC, or any agency of the US Government.

Statement of Test Results Uncertainty: Following the guidelines of NAMAS publication NIS81 and NIST Technical Note 1297, the Measurement Uncertainty at a 95% confidence level is determined to be: ± 3.6 dB

Manufacturer/Applicant [2.1033(b1)]

The manufacturer and applicant:

JOHNSON CONTROLS INTERIORS, LLC.
One Prince Center
Holland, Michigan 49423

Measurement/Test Site Facility & Equipment**Test Site [2.948, 2.1033(b6)]**

The AHD test facility is centered on 9 acres of rural property near Sister Lakes, Michigan. The mailing address is 92723 M-152, Dowagiac, Michigan 49047. This test facility is NVLAP accredited (LabCode 200129-0). It has been fully described in a report filed with the FCC and Industry Canada. The report filed with the FCC is, dated November 5, 1996, was accepted by the FCC in a letter dated January 15, 1997 and reconfirmed July 14, 2000, (31040/SIT 1300F2). The report filed with Industry Canada, dated August 11, 1998, was accepted via a letter dated September 1, 1998, (file:IC3161).

Measurement Equipment Used [2.947(d), 15.31(b)]

Equipment	Model	S/N	Last Cal Date	Calibration Interval
HP EMI Receiver system	HP 8546A			
RF Filter Section	HP-85460A	3448A00283	24-Aug-00	12 month
RF Receiver Section	HP-85462A	3625A00342	24-Aug-00	12 month
EMCO BiconiLog Antenna	3142	1077	28-Jul-00	12 months
(3-M) Type 129FF Ultra Flex LowLoss	RG58/U	9910-12	27-Jun-00	6 months
50ohm Coax	RG223/U	9802302	27-Jun-00	12 months
University of Mich Double Ridge Horn	0.2 - 5.0GHz	C	16-Mar-99	24 months
6 ft. Andrew DF4 Helix		9912-02	13-Dec-99	12 months

Measurement Environment

The tests were performed with the equipment under test, and measurement equipment inside the all-weather enclosure. Ambient temperature was 22deg.C., the relative humidity 40%.

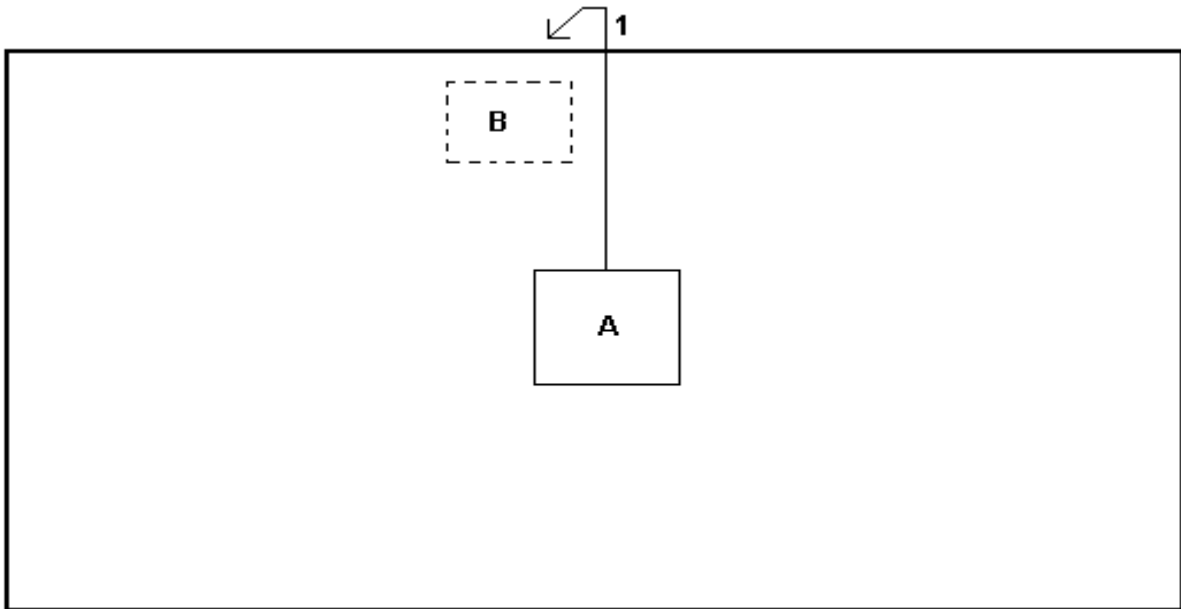
Tested Configuration /Setup: [2.1033(b8)]

Support Equipment & Cabling

Setup Diagram Legend	Description	Model	Serial No. / Part No.	EMC Consideration
A	[EUT] Universal Garage Door Opener	[JCI] CB2VWHL3	--	FCC ID: CB2VWHL3
B	12V DC Power Supply	[Trygon] DL40-1	7968152	Located on the turntable base below the EUT table.
1	Power Supply Cable Harness	--	--	1.5 meters, Unshielded, 8-lead lightly twisted cable harness.

Setup Diagram

Note: Setup photographs are located in Attached Electronic File, Exhibit L.



setup_11

BASIC EUT SETUP
 (Legend designation is above)

Standards Applied to Test: [2.1033(b6)]

ANSI C63.4 - 1992, Appendix I

CFR47 FCC Part 2, Part 15, SubPart C, 15.231 Intentional Radiator; SubPart B, Digital Device

Test Methodology: [2.1033(b6)]

The pictures in this report, showing test setups, indicate the agreed upon configuration of testing for this product-type.

For the testing, the EUT was placed at the center of the table 80cm above the ground plane pursuant to ANSI C63.4 for stand-alone equipment. The 8 conductor cable harness was routed to the edge of the long side of the table then down to the power supply and button/LED board located on the turntable base.

The line conducted emission testing was not performed on this product. In its final configuration the product is powered from an automobile 12 volt system only.

Radiated

The system was placed upon a 1 x 1.5 meter non-metallic table 80cm above the open field site ground plane in the prescribed setup per ANSI C63.4, Figure 9(c).

The table sits upon a remote controlled turntable. The receiving antenna, located at the appropriate standards distance of 3 or 10 meters from the table center, is also remote controlled.

The principle settings of the EMI Receiver for radiated testing include:

IF Bandwidth: 120KHz for frequencies less than 1GHz.
1 MHz for frequencies greater than 1GHz.

Detector Function: Peak Mode

The Average levels were determined mathematically based upon the duty cycle of the pulsed modulation of the transmitted signal.

At frequencies up to 1000MHz a BiconiLog broadband antenna was used for measurements.

At frequencies above 1000MHz a double-ridge Horn broadband antenna was used for measurements.

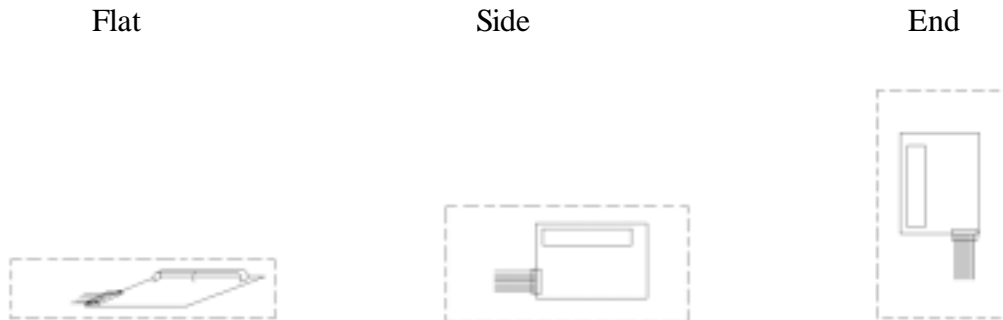
During the evaluation the EUT was transmitting continuously.

The turntable was rotated 360 degrees and the receiving antenna height varied from 1 to 4 meters to search out the highest emissions.

Preliminary tests were done at 288MHz, 303MHz, 310MHz, 335MHz, 360MHz, 380MHz, 390MHz, 410MHz, and 418MHz. The final measurements were made at a low band frequency (288MHz), a mid band frequency (310MHz), and a high band frequency (418MHz) pursuant to the requirements of 47CFR 15.31(m). At each frequency the EUT was placed in three orthogonal positions. At each position a 500Hz pulse modulation was adjusted to a 30%, 50%, and 80% duty cycle. At each duty cycle, measurements were taken with the receive antenna in vertical and horizontal positions.

The unit was evaluated up to the tenth harmonic of the fundamental as an intentional radiator, and up to 1000MHz as a digital device.

The orthogonal positions are:



THE HP8546A EMI Receiver has stored in memory the antenna and coax correction factors used in this test. The resultant Field Strength (FS) in dBuV/m presented by the HP8546A is the summation in decibels (dB) of the Received Level (RF), the Antenna Correction Factor (AF), and the Cable Loss Factor (CF).

Formula 1: $FS(\text{dBuV/m}) = RF(\text{dBuV}) + AF(\text{dB/m}) + CF(\text{dB})$

The resultant Field Strength measurement is recorded using the peak hold detector of the HP8546A.

This recorded peak level is further corrected, by calculation, to an average level by a factor determined by the duty cycle of the pulsed modulation. The duty cycle factor is determined as outlined in Appendix I4 of the standard ANSI C63.4:1992.

Formula 2: Average Level(uV/m) = [Peak Level(uV/m)] x [duty cycle factor].

Formula 2a: Average Level(dBuV/m) = Peak Level(dBuV/m) + duty cycle factor(dB).

The duty cycle factor to apply is determined for the duty cycles of 30%, 50% and 80% as follows.

For 30% (0.30): duty cycle factor(dB) = $20 \cdot \text{Log}(0.3) = -10.46$

For 50% (0.50): duty cycle factor(dB) = $20 \cdot \text{Log}(0.5) = -6.02$

For 80% (0.80): duty cycle factor(dB) = $20 \cdot \text{Log}(0.8) = -1.94$

SAMPLE CALCULATION:

A measured peak level of 50% duty cycle pulse modulated signal is 500uV/m.

Calculated to dBuV/m is $20 \cdot \text{Log}(500) = 53.98$ dBuV/m Peak level.

Applying the duty cycle factor: Avg. Level(dBuV/m) = $53.98 - 6.02$ dB = 47.96dBuV/m.