

# AHD

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

### **Test Report for FCC ID: CB2JAGHL3** **FCC Part 2.1031, Part 15 Subpart C(15.231)**

**Report #20000307F**  
**Issued 9/18/00**



### **TRANSMITTER MODEL CB2JAGHL3 OF HOMELINK® III SERIES**

Prepared for:

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One Prince Center  
Holland, MI 49423

Test Date(s): April 4 thru April 6, 2000

data recorded by

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Test Engineer, AHD

witnessed by

Craig Harder

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:  $\pm 3.6$  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<br>Date | Calibration<br>Interval |
|-------------------------------------|-----------|------------|------------------|-------------------------|
| HP EMI Receiver system              | HP 8546A  |            |                  |                         |
| RF Filter Section                   | HP-85460A | 3448A00283 | 22-Jun-99        | 12 month                |
| RF Receiver Section                 | HP-85462A | 3625A00342 | 22-Jun-99        | 12 month                |
| EMCO BiconiLog Antenna              | 3142      | 1077       | 07-Sep-99        | 12 months               |
| (3-M) Type 129FF Ultra Flex LowLoss | RG58/U    | 9910-12    | 29-Oct-99        | 6 months                |
| ElectroMetrics Double Ridge Horn    | RGA-60    | 6147       | 16-Mar-99        | 12 months               |

**Measurement Environment**

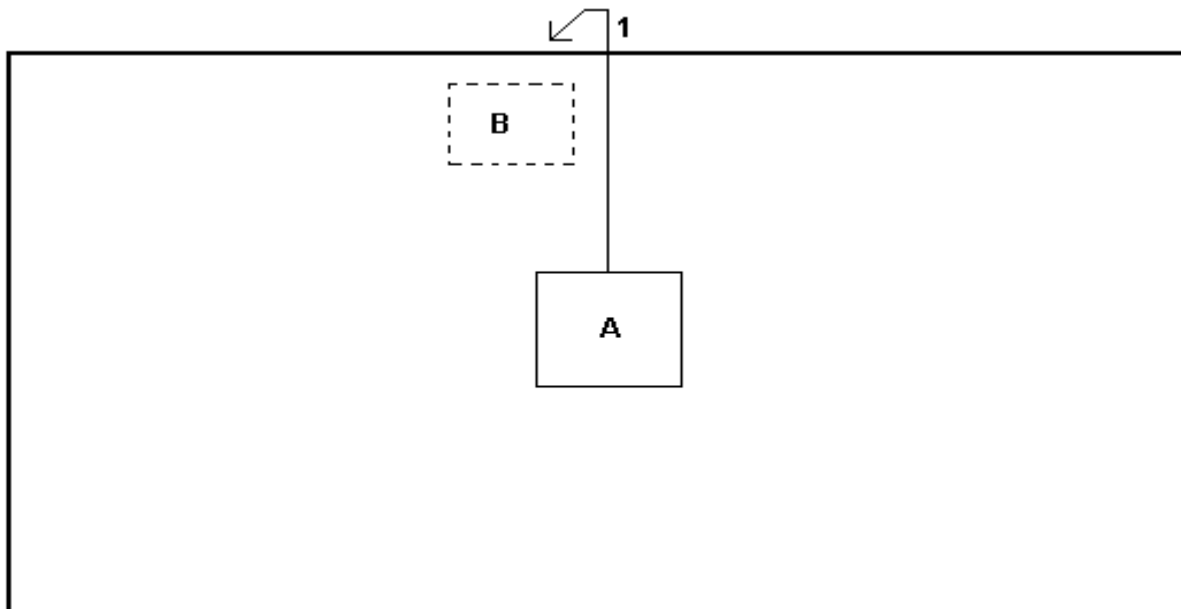
The tests were performed with the equipment under test, and measurement equipment inside the all-weather enclosure. Ambient temperature was 22deg.C., the relative humidity 40%.

**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] CB2JAGHL3    | --                    | FCC ID: CB2JAGHL3                                           |
| B                    | 12V DC Power Supply                | [Kikusui] PAB 18-3 | 47263914              | Located on the turntable base below the EUT table.          |
| 1                    | Power Supply Cable Harness         | --                 | --                    | 2 meters, Unshielded, 2-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)

## Summary of Results:

1. This test series evaluated the Equipment Under Test to FCC Part 15, SubPart C.
2. The system tested is compliant to the requirement of CFR 47, FCC Part 15, SubPart C for periodic operation in the allowed frequency bands above 70MHz, ( Part 15.231 ).
3. The equipment under test was received on April 4, 2000 and this test series commenced on April 4, 2000.
4. The line conducted emission testing does not apply to this product. The device is powered from a 12 volt automobile source.
5. The preliminary scan for spurious emissions conducted in a shielded room indicated low level spurious signals. These emissions were not observable at the 3-meter OATS.
6. The frequencies selected for final evaluation include 288MHz, 310MHz, and 418MHz. This is in accordance with 47 CFR 15.31(m). The 310MHz was selected as a mid-range frequency because it is the predominant frequency used in controlling garage doors. Past correspondence with the FCC regarding the selection of frequencies and test setup suggest this judgment as appropriate.
7. Occupied Band Width of the transmitted signal, at the 20dB point, nearest the limit was measured to be 510KHz. This measurement occurred with the EUT transmitting at 288MHz with a pulse modulation of 50% duty cycle. This measurement is within the allowed 720KHz bandwidth. The greatest bandwidth measured was 525KHz with the EUT transmitting at 418MHz
8. The field strength level of the fundamental was measured for 288MHz, 310MHz, and 418MHz. The evaluation showed the emission nearest the limit occurred while operating at 310MHz with 500Hz pulsed modulation at a 50% duty cycle. The EUT was positioned on the 'end' and the receive antenna oriented in the horizontal polarization. This signal was measured to be 0.5dB below the limit of 75.3dBuV/m (5821uV/m).
9. The evaluation of the field strength levels of the harmonics showed the emission nearest the limit occurred while operating at 418MHz with 500Hz pulsed modulation at 80% duty cycle. The EUT was positioned on the 'side'; and the receive antenna oriented in the vertical polarization. This signal, at 1672MHz, was measured to be 16.5dB below the limit of 54.0dBuV/m (501uV/m).
10. Digital Spurious Emissions: There are no detectable spurious emissions associated with the digital portion of the CB2JAGHL3.
11. The average value of the coarse tune pulses over a 100mSec time, nearest the limit, occurred at 418MHz. The average measurement was determined to be 8918uV/m which is 1.6dB below the limit of 10,333uV/m..
12. The average value of the fine tune pulses over a 100mSec time, nearest the limit, occurred at 418MHz. The average measurement was determined to be 1927uV/m which is 14.6dB below the limit of 10,333uV/m.

**Changes made to achieve compliance**

1. NONE

**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 12volt supply harness was routed to the edge of the long side of the table then down to the power supply 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.

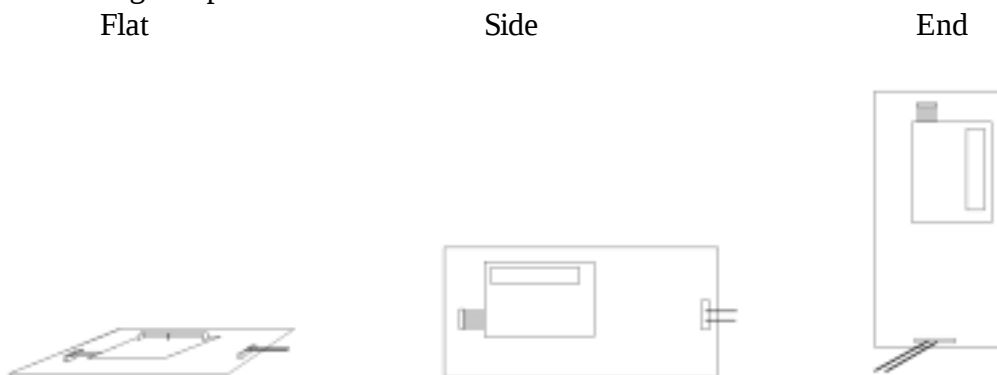
During the evaluation the EUT was transmitting continuously.

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, 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) =  $20 \times \log(0.3) = -10.46$

For 50% (0.50):      duty cycle factor(dB) =  $20 \times \log(0.5) = -6.02$

For 80% (0.80):      duty cycle factor(dB) =  $20 \times \log(0.8) = -1.94$

#### SAMPLE CALCULATION:

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

Calculated to dBuV/m is  $20 \times \log(500) = 53.98$  dBuV/m Peak level.

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