



**FCC Part 1 Subpart I  
FCC Part 2 Subpart J  
ISED CANADA RSS 102 ISSUE 5**

**RF EXPOSURE REPORT**

**FOR**

**TOUCHSCREEN DISPLAY**

**MODEL NUMBER: C4-WALL7-XX, C4-WALL10-XX (XX is either BL or WH  
depending on color)**

**FCC ID: R33C4WALL5G  
IC: 7848A-C4LGWM**

**REPORT NUMBER: R12077761-E1**

**ISSUE DATE: 2018-09-18**

**Prepared for  
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**NVLAP<sup>®</sup>**  
TESTING  
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Revision History

| Ver. | Issue Date | Revisions  | Revised By      |
|------|------------|--|-----------------|
| 1    | 2018-05-22 | Initial Issue  | Brian T. Kiewra |
| 2    | 2018-05-29 | Clarified model numbers on cover page and Section 1.<br>Revised antenna gain information in Section 6. | Brian T. Kiewra |
| 3    | 2018-06-21 | Revised antenna gain information in Section 6.   | Niklas Haydon   |
| 4    | 2018-09-18 | Revised antenna gain information in Section 6.   | Brian T. Kiewra |

## TABLE OF CONTENTS

|   |           |
|---|-----------|
| <b>1. ATTESTATION OF TEST RESULTS .....</b>     | <b>4</b>  |
| <b>2. TEST METHODOLOGY .....</b>                | <b>5</b>  |
| <b>3. REFERENCES .....</b>                      | <b>5</b>  |
| <b>4. FACILITIES AND ACCREDITATION .....</b>    | <b>5</b>  |
| <b>5. MAXIMUM PERMISSIBLE RF EXPOSURE .....</b> | <b>6</b>  |
| 5.1. <i>FCC RULES</i> .....                     | 6         |
| 5.2. <i>IC RULES</i> .....                      | 7         |
| 5.3. <i>EQUATIONS</i> .....                     | 8         |
| 5.4. <i>LIMITS AND IC EXEMPTION</i> .....       | 10        |
| <b>6. RF EXPOSURE RESULTS .....</b>             | <b>11</b> |

## 1. ATTESTATION OF TEST RESULTS

**COMPANY NAME:** Control 4 Corporation  
11734 S. Election Road  
Salt Lake City, UT 84020, USA

**EUT DESCRIPTION:** Touchscreen Display

**MODEL:** C4-WALL7-XX, C4-WALL10-XX (XX is either BL or WH depending on color).

**SERIAL NUMBER:** 000FFF80AB7C

**DATE TESTED:** 2017-12-19

| APPLICABLE STANDARDS                    |              |
|---|--------------|
| STANDARD                                | TEST RESULTS |
| FCC PART 1 SUBPART I & PART 2 SUBPART J | Complies     |
| ISED CANADA RSS 102 ISSUE 5             | Complies     |

UL LLC tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by UL LLC based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

**Note:** The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by UL LLC and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL LLC will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the U.S. Government.

Approved & Released  
For UL LLC By:



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Prepared By:



Brian T. Kiewra  
Project Engineer  
UL – Consumer Technology Division

## 2. TEST METHODOLOGY

All calculations were made in accordance with FCC Parts 2.1091, 2.1093 and KDB 447498 D01 v06 and IC Safety Code 6, RSS 102 Issue 5.

## 3. REFERENCES

All measurements were made as documented in test report UL LLC Documents 15U19841-E2 Revision A and RR12077761-E1 for operation in the 5 GHz bands.

Output power, duty cycle, and antenna gain data is excerpted from the applicable test reports and product documentation provided by the applicant.

## 4. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 12 Laboratory Dr., Research Triangle Park, NC 27709, USA and 2800 Perimeter Park Drive, Suite B, Morrisville, NC 27560.

UL LLC (RTP) is accredited by NVLAP, Laboratory Code 200246-0. The full scope of accreditation can be viewed at <http://ts.nist.gov/standards/scopes/2002460.htm>.

## 5. MAXIMUM PERMISSIBLE RF EXPOSURE

### 5.1. FCC RULES

§1.1310 The criteria listed in Table 1 shall be used to evaluate the environmental impact of human exposure to radio-frequency (RF) radiation as specified in §1.1307(b), except in the case of portable devices which shall be evaluated according to the provisions of §2.1093 of this chapter.

TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

| Frequency range (MHz)                                   | Electric field strength (V/m) | Magnetic field strength (A/m) | Power density (mW/cm <sup>2</sup> ) | Averaging time (minutes) |
|---|-------------------------------|-------------------------------|-------------------------------------|--------------------------|
| (A) Limits for Occupational/Controlled Exposures        |                               |                               |                                     |                          |
| 0.3–3.0 .....   | 614                           | 1.63                          | *(100)                              | 6                        |
| 3.0–30 .....  | 1842/f                        | 4.89/f                        | *(900/f <sup>2</sup> )              | 6                        |
| 30–300 .....  | 61.4                          | 0.163                         | 1.0                                 | 6                        |
| 300–1500 .....  | .....                         | .....                         | f/300                               | 6                        |
| 1500–100,000 .....                                      | .....                         | .....                         | 5                                   | 6                        |
| (B) Limits for General Population/Uncontrolled Exposure |                               |                               |                                     |                          |
| 0.3–1.34 .....  | 614                           | 1.63                          | *(100)                              | 30                       |
| 1.34–30 .....   | 824/f                         | 2.19/f                        | *(180/f <sup>2</sup> )              | 30                       |

TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)—Continued

| Frequency range (MHz) | Electric field strength (V/m) | Magnetic field strength (A/m) | Power density (mW/cm <sup>2</sup> ) | Averaging time (minutes) |
|-----------------------|-------------------------------|-------------------------------|-------------------------------------|--------------------------|
| 30–300 .....          | 27.5                          | 0.073                         | 0.2                                 | 30                       |
| 300–1500 .....        | .....                         | .....                         | f/1500                              | 30                       |
| 1500–100,000 .....    | .....                         | .....                         | 1.0                                 | 30                       |

f = frequency in MHz

\* = Plane-wave equivalent power density

NOTE 1 TO TABLE 1: Occupational/controlled limits apply in situations in which persons are exposed as a consequence of their employment provided those persons are fully aware of the potential for exposure and can exercise control over their exposure. Limits for occupational/controlled exposure also apply in situations when an individual is transient through a location where occupational/controlled limits apply provided he or she is made aware of the potential for exposure.

NOTE 2 TO TABLE 1: General population/uncontrolled exposures apply in situations in which the general public may be exposed, or in which persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or can not exercise control over their exposure.

## 5.2. IC RULES

IC Safety Code 6 (2015), Section 2.2.2: To ensure compliance with the basic restrictions outlined in Section 2.1, at frequencies between 10 MHz and 300 GHz, the reference levels for electric- and magnetic-field strength and power density must be complied with.

**TABLE 5:** Reference Levels for Electric Field Strength, Magnetic Field Strength and Power Density in Uncontrolled Environments

| Frequency (MHz) | Electric Field Strength ( $E_{RL}$ ), (V/m, RMS) | Magnetic Field Strength ( $H_{RL}$ ), (A/m, RMS) | Power Density ( $S_{RL}$ ), (W/m <sup>2</sup> ) | Reference Period (minutes) |
|-----------------|--|--|---|----------------------------|
| 10–20           | 27.46  | 0.0728   | 2   | 6                          |
| 20–48           | $58.07 / f^{0.25}$                               | $0.1540 / f^{0.25}$                              | $8.944 / f^{0.5}$                               | 6                          |
| 48–300          | 22.06  | 0.05852  | 1.291   | 6                          |
| 300–6000        | $3.142 f^{0.3417}$                               | $0.008335 f^{0.3417}$                            | $0.02619 f^{0.6834}$                            | 6                          |
| 6000–15000      | 61.4   | 0.163  | 10  | 6                          |
| 15000–150000    | 61.4   | 0.163  | 10  | $616000 / f^{1.2}$         |
| 150000–300000   | $0.158 f^{0.5}$                                  | $4.21 \times 10^{-4} f^{0.5}$                    | $6.67 \times 10^{-5} f$                         | $616000 / f^{1.2}$         |

Frequency,  $f$ , is in MHz.

**TABLE 6:** Reference Levels for Electric Field Strength, Magnetic Field Strength and Power Density in Controlled Environments

| Frequency (MHz) | Electric Field Strength ( $E_{RL}$ ), (V/m, RMS) | Magnetic Field Strength ( $H_{RL}$ ), (A/m, RMS) | Power Density, ( $S_{RL}$ ), (W/m <sup>2</sup> ) | Reference Period (minutes) |
|-----------------|--|--|--|----------------------------|
| 10–20           | 61.4   | 0.163  | 10   | 6                          |
| 20–48           | $129.8 / f^{0.25}$                               | $0.3444 / f^{0.25}$                              | $44.72 / f^{0.5}$                                | 6                          |
| 48–100          | 49.33  | 0.1309   | 6.455  | 6                          |
| 100–6000        | $15.60 f^{0.25}$                                 | $0.04138 f^{0.25}$                               | $0.6455 f^{0.5}$                                 | 6                          |
| 6000–15000      | 137  | 0.364  | 50   | 6                          |
| 15000–150000    | 137  | 0.364  | 50   | $616000 / f^{1.2}$         |
| 150000–300000   | $0.354 f^{0.5}$                                  | $9.40 \times 10^{-4} f^{0.5}$                    | $3.33 \times 10^{-4} f$                          | $616000 / f^{1.2}$         |

Frequency,  $f$ , is in MHz.

### NOTES FOR TABLES 5 AND 6:

- For exposures shorter than the reference period, field strengths may exceed the reference levels, provided that the time average of the squared value of the electric or magnetic field strength over any time period equal to the reference period shall not exceed  $E_{RL}^2$  or  $H_{RL}^2$ , respectively. For exposures longer than the reference period, including indefinite exposures, the time average of the squared value of the electric or magnetic field strength over any time period equal to the reference period shall not exceed  $E_{RL}^2$  or  $H_{RL}^2$ , respectively.

### **5.3. EQUATIONS**

#### **POWER DENSITY**

Power density is given by:

$$S = \text{EIRP} / (4 * \text{Pi} * D^2)$$

Where

S = Power density in mW/cm<sup>2</sup>

EIRP = Equivalent Isotropic Radiated Power in mW

D = Separation distance in cm

Power density in units of mW/cm<sup>2</sup> is converted to units of W/m<sup>2</sup> by multiplying by 10.

#### **DISTANCE**

Distance is given by:

$$D = \text{SQRT} (\text{EIRP} / (4 * \text{Pi} * S))$$

Where

D = Separation distance in cm

EIRP = Equivalent Isotropic Radiated Power in mW

S = Power density in mW/cm<sup>2</sup>

#### **SOURCE-BASED DUTY CYCLE**

Where applicable (for example, multi-slot cell phone applications) a duty cycle factor may be applied.

$$\text{Source-based time-averaged EIRP} = (\text{DC} / 100) * \text{EIRP}$$

Where

DC = Duty Cycle in %, as applicable

EIRP = Equivalent Isotropic Radiated Power in W



### **MIMO AND COLOCATED TRANSMITTERS (IDENTICAL LIMIT FOR ALL TRANSMITTERS)**

For multiple chain devices, and colocated transmitters operating simultaneously in frequency bands where the limit is identical, the total power density is calculated using the total EIRP obtained by summing the EIRP (in linear units) of each transmitter.

$$\text{Total EIRP} = (\text{EIRP1}) + (\text{EIRP2}) + \dots + (\text{EIRPn})$$

where

EIRPx = Source-based time-averaged EIRP of chain x or transmitter x

The total EIRP is then used to calculate the Power Density or the Distance as applicable.

### **MIMO AND COLOCATED TRANSMITTERS**

For multiple colocated transmitters operating simultaneously in frequency bands where different limits apply:

The Power Density at the specified separation distance is calculated for each transmitter chain or transmitter.

The fraction of the exposure limit is calculated for each chain or transmitter as  
(Power Density of chain or transmitter) / (Limit applicable to that chain or transmitter).

The fractions are summed.

Compliance is established if the sum of the fractions is less than or equal to one.

## 5.4. LIMITS AND IC EXEMPTION

### INDUSTRY CANADA EXEMPTION

RSS-102 Clause 2.5.2 RF exposure evaluation is required if the separation distance between the user and the device's radiating element is greater than 20 cm, except when the device operates as follows:

- at or above 300 MHz and below 6 GHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than  $1.31 \times 10^{-2} f^{0.6834}$  W (adjusted for tune-up tolerance), where  $f$  is in MHz;

## 6. RF EXPOSURE RESULTS

In the table(s) below, Power and Gain are entered in units of dBm and dBi respectively and conversions to linear forms are used for the calculations.

| Band    | Mode | Separation<br>Distance<br>(cm) | Output<br>Power<br>(dBm) | Antenna<br>Gain<br>(dBi) | Duty<br>Cycle<br>(%) | EIRP<br>(mW) | FCC Power<br>Density<br>(mW/cm <sup>2</sup> ) | IC Power<br>Density<br>(W/m <sup>2</sup> ) |
|---------|------|--------------------------------|--------------------------|--------------------------|----------------------|--------------|---|--|
| 2.4 GHz | WLAN | 20                             | 15.50                    | 3.80                     | 100.0                | 85.1         | 0.017   | 0.17                                       |
| 5 GHz   | WLAN | 20                             | 13.50                    | 5.70                     | 100.0                | 83.2         | 0.017   | 0.17                                       |

The device operates above 1.5 GHz with a maximum EIRP less than or equal to 5 Watts as a mobile device with a minimum separation distance of 20 cm, therefore it is exempt from routine RF Exposure Evaluation under RSS-102.

### **Notes:**

- 1) For MPE the new KDB 447498 requires the calculations to use the maximum rated power; that power should be declared by the manufacturer.
- 2) A tolerance value of +0.5 dB was included in the output power values above to cover the output power tolerance of +/-0.5 dB under extreme conditions in the real filed as declared by the client.

**END OF REPORT**