

# USER'S GUIDE

## EE210 - Humidity and Temperature Sensor for demanding Climate Control Applications

### GENERAL

The EE210 sensor, available for wall or duct mounting as well as with remote probe, is designed for highly accurate measurement of humidity and temperature in demanding climate control applications. The EE210 incorporates the E+E humidity and temperature sensor HCT01.

For use in special applications do not hesitate to contact E+E Elektronik or a local distributor.

### CAUTION

- For accurate measurement it is essential that the temperature of the probe and mainly of the sensing head is same as the temperature of the air to measure. Avoid mounting the sensor in a way which creates temperature gradients along the probe.
- The sensor and mainly the sensing head shall not be exposed to extreme mechanical stress.
- The sensor must be operated with the filter cap on at all times. Do not touch the sensing element inside the sensing head.
- While replacing the filter cap (because of pollution for instance) against an original spare one please take very good care to not touch the sensors.

### SCOPE OF SUPPLY

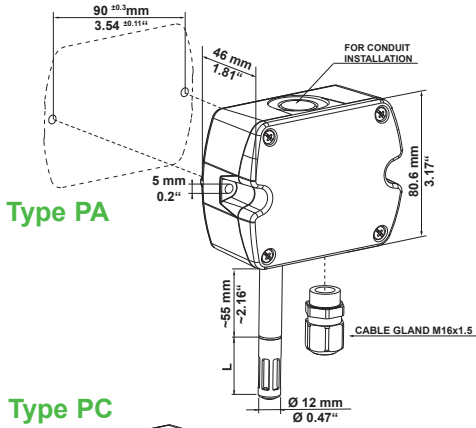
Model	EE210 Wall mount (Type PA)	EE210 Duct mount (Type PB)	EE210 Remote version (Type PC)*	EE210-P Remote probe* for Type PC	Additionally for all EE210 with RS485 interface
EE210 according ordering guide	✓	✓	✓	✓	
Cable gland	✓	✓	✓ (2 pcs.)		✓
Mounting materials	✓	✓	✓		
Mounting flange		✓		✓	
Inspection certificate according to DIN EN10204 - 3.1	✓	✓	✓	✓	
Quick Guide - EE210 RS485 Setup					✓

\* EE210-P is not included in the Scope of Supply of the EE210 Type PC

### ACCESSORIES

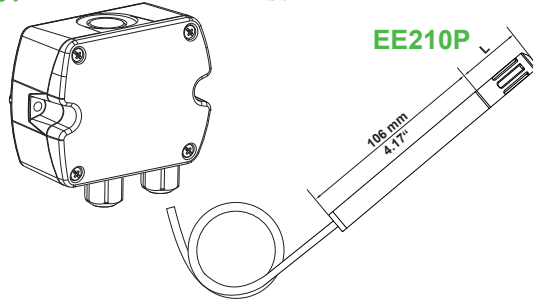
USB configuration adapter	HA011066
Product configuration software	EE-PCS (free download: <a href="http://www.epluse.com/EE210">www.epluse.com/EE210</a> )
Power supply adapter	V03 (see data sheet Accessories)
Protection cap for 12 mm probe	HA010783

## DIMENSIONS / MOUNTING

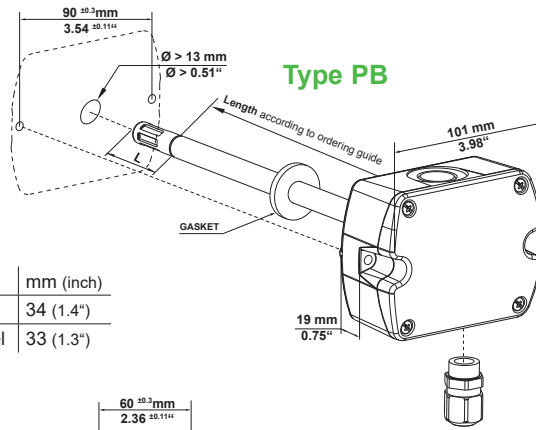


Type PA

Type PC

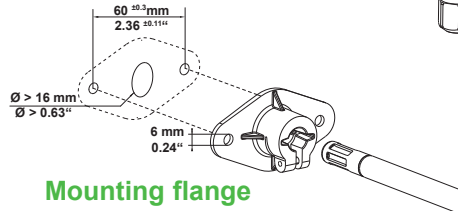


EE210P



Type PB

L = filter cap	mm (inch)
Membrane	34 (1.4")
Stainless steel	33 (1.3")



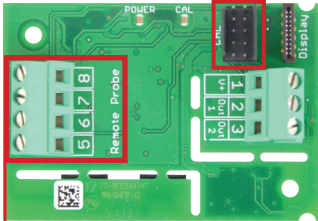
Mounting flange

in the scope of supply for Type PA and PC

**EE210 with cable gland:** Use a matching wrench to install the cable gland (in the scope of supply) onto the EE210 enclosure.  
**EE210 with conduit connection** for the North American market: use a flat screwdriver to knock open the blind, carefully, in order to avoid damaging the electronics inside the enclosure. The conduit adapter is not included in the scope of supply. The M16x1.5 opening for the cable gland shall be tightly closed using the blind plug included in the scope of supply.

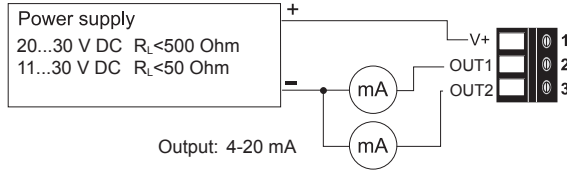
## CONNECTION DIAGRAM

EE210-HT6



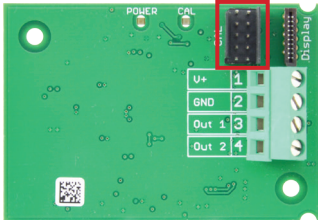
**ONLYFORREMOTEPROBE!**

EE210-HT6

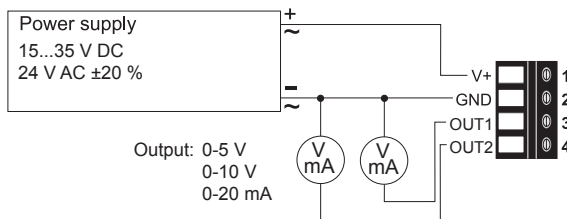


**Important:** The EE210-HT6 (4...20 mA, two-wire) with display operates correctly only if both outputs are connected.

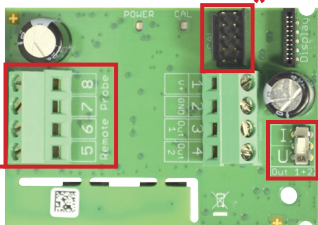
EE210-HT3



EE210-HT2/3/5



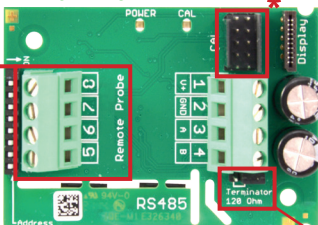
EE210-HT2/3/5



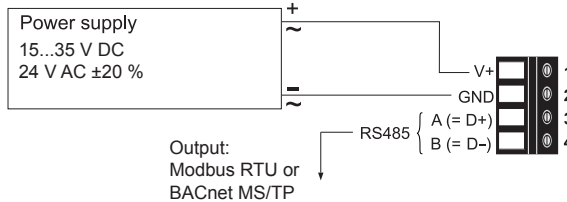
Selection output signal U / I

**ONLYFORREMOTEPROBE!**

EE210-HTx3



EE210-HTx3



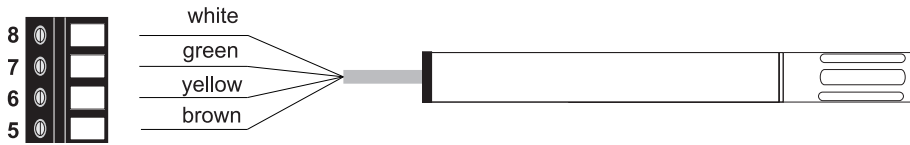
Bus termination resistor 120 Ω (jumper)

\* configuration connector

## EE210P (type PC)

The EE210P remote probe for EE210-HTxxPC shall be ordered and it is supplied as separate item. EE210P is to be connected to the EE210 by the user.

- Install first the cable gland (included in EE210 scope of supply) onto the EE210 enclosure.
- Before connecting the probe, disconnect the EE210 power supply.
- Insert the EE210P cable through the cable gland and connect it to the screw terminals according to the connection diagram below.



### Please note:

EE210P is an intelligent probe with digital output and as such it is interchangeable. In case the probe or its cable gets destroyed or if a longer cable is needed, please order a replacement probe according to EE210 data sheet. The replacement probe shall be installed as described above.

### Important:

Make sure that the cable glands are closed tightly for both EE210P probe cable and for the power supply and outputs cable. This is necessary for assuring the protection class (IP class) of the enclosure according to EE210 specification, as well as for stress relief at the screw terminals on the EE210 board.

## LED INDICATION

### Green LED

Information during normal operation

- on = everything OK
- flashing = the main board does not recognize the measurement electronics inside the RH probe
- off = no power supply or main board failure

### Blue LED

Information during setup with the optional USB configuration adapter HA011066 and the EE-PCS Product Configuration Software

- on = USB stick connected to PC, no communication with EE-PCS
- flashing = communication in progress with EE-PCS
- off = USB stick not connected to PC

## DISPLAY

### Factory Setup:

The display shows the two parameters selected for output 1 and output 2 (according to ordering code). For digital output versions the display shows RH and T.

### User Setup:

The user can change the display layout to 1, 2 or 3 lines and select the parameters to be displayed by using EE-PCS Product Configuration Software (free download from [www.epluse.com/configurator](http://www.epluse.com/configurator)) and the optional USB configuration adapter (not included in the scope of supply).

**Important:** The EE210-HT6 (4...20 mA, two-wire version) with display operates correctly only if both outputs are connected.



## SELECTION OUTPUT SIGNAL U/I

The factory setup of the output signal and scaling corresponds to the type number as ordered.

The output signal (voltage or current 3-wire) can be selected with the DIP switch on the main electronics board (see picture PCB EE210-HT2/3/5). This does not impact on the scaling of the outputs, which can be changed using USB configuration adapter and the EE-PCS.

### Examples

Factory setup: voltage output 0-5 V or 0-10 V corresponds to 0...100% RH.

After switching from U to I: current output 0...20 mA corresponds to 0...100% RH.

A change of the current output range for instance to 4-20 mA (3-wire) can be made subsequently with the USB configuration adapter and EE-PCS.

Factory setup: current output 0-20 mA corresponds to -10...50 °C.

After switching from I to U: voltage output 0-10 V corresponds to -10...50 °C.

A change of the voltage output range for instance to 0-5 V can be made subsequently with the USB configuration adapter and EE-PCS.

## DIGITAL SETTINGS

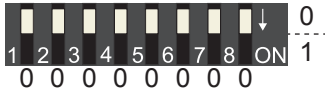
### HARDWARE BUS TERMINATION

If required, the bus termination shall be realized with 120 Ohm resistor, jumper on the board.

- Jumper mounted = bus terminated
- Jumper not mounted = bus not terminated

### ADDRESS SWITCH

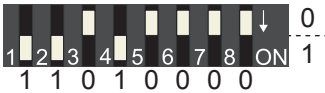
#### Address Switch



#### Address setting via EE-PCS Product Configuration Software

All DIP switches at position 0 → address has to be set via Product Configuration Software  
 Factory setting: 242 (permitted values: 1...247).  
 Example: Slave address is set via configuration software.

#### Address Switch



#### Address setting via DIP switch

Setting the DIP switches to any other address than 0, overrules the slave address set via configuration software (permitted values: 1...247).  
 Example: Slave address set to 11 (= 0000 1011 binary).

### DIGITAL SETTINGS

	Factory settings	Selectable values
Baud rate	9600	9600, 19200, 38400, 57600, 76800, 115200
Data bits	8	8
Parity	EVEN	None, odd, even
Stop bits	1	1 or 2
Slave address	242	1...247

ID address, baud rate, parity and stop bits can be set via:

1. EE-PCS, Product Configuration Software and the appropriate configuration cable.
2. Modbus protocol in the register 60001 (0x00) and 60002 (0x01). See Application Note Modbus AN0103 (available on [www.epluse.com/EE210](http://www.epluse.com/EE210))

The measured values are saved as a 32 bit float value and as 16 Bit signed integer, see the Modbus Register map below.

The serial number as ASCII-code is located at read register address 30001-30008 (16 bit per address).

The firmware version is located at register address 30009 (bit 15...8 = major release; bit 7...0 = minor release).

The sensor name is located at register address 30010.

### MODBUS REGISTER MAP

FLOAT 32 bit (read register):			
Function code / Register number <sup>1)</sup> [Dec]	Register address <sup>2)</sup> [Hex]	Parameter name	Unit <sup>3)</sup>
30026	0x19	temperature	[°C], [°F]
30028	0x1B	relative humidity	[%]
30030	0x1D	water vapour partial pressure	[mbar], [psi]
30032	0x1F	dew point temperature	[°C], [°F]
30034	0x21	wet bulb temperature	[°C], [°F]
30036	0x23	absolute humidity	[g/m <sup>3</sup> ], [g/ft <sup>3</sup> ]
30038	0x25	mixing ratio	[g/kg], [gr/lb]
30040	0x27	specific enthalpy	[kJ/kg], [BTU/lb]
30042	0x29	frost point temperature	[°C], [°F]

INTEGER 16 bit (read register):				
Function code / Register number <sup>1)</sup> [Dec]	Register address <sup>2)</sup> [Hex]	Parameter name	Unit <sup>3)</sup>	Scale <sup>4)</sup>
30301	0x12C	temperature	[°C], [°F]	100
30302	0x12D	relative humidity	[%]	100
30303	0x12E	water vapour partial pressure	[mbar], [psi]	100
30304	0x12F	dew point temperature	[°C], [°F]	100
30305	0x130	wet bulb temperature	[°C], [°F]	100
30306	0x131	absolute humidity	[g/m <sup>3</sup> ], [g/ft <sup>3</sup> ]	100
30307	0x132	mixing ratio	[g/kg], [gr/lb]	100
30308	0x133	specific enthalpy	[kJ/kg], [BTU/lb]	100
30309	0x134	frost point temperature	[°C], [°F]	100

INTEGER 16 bit (read and write register):		
Function code / Register number <sup>1)</sup> [Dec]	Register address <sup>2)</sup> [Hex]	Parameter name
60001	0x00	Slave-ID <sup>5)</sup> modbus address
60002	0x01	Modbus protocol settings <sup>6)</sup>

INFO (read register):		
Function code / Register number <sup>1)</sup> [Dec]	Register address <sup>2)</sup> [Hex]	Parameter name
30001	0x00	Serial number (as ASCII)
30009	0x01	Firmware version
30010	0x09	Sensor Name

1) Register number starts from 1

2) Register address starts from 0

3) The choice of measurement units (metric or non-metric) must be done in the ordering guide, see EE210 data sheet. Switching from metric to non-metric or vice versa by using the EE-PCS is not possible.

4) 100 is scale 1:100 (2550 is equivalent to 25.5 °C)

5) If the ID is set via DIP-switch the response will be NAK

6) For Modbus protocol settings please see Application Note Modbus AN0103 (available on [www.epluse.com/EE210](http://www.epluse.com/EE210))

## READING EXAMPLE

Example of MODBUS RTU command for reading the temperature (float value) T = 24,270019 °C from the register 0x19:

Device EE210; slave ID 242 [F2 in Hex]

Reference document, chapter 6.3: [http://www.modbus.org/docs/Modbus\\_Application\\_Protocol\\_V1\\_1b.pdf](http://www.modbus.org/docs/Modbus_Application_Protocol_V1_1b.pdf)

Request [Hex]: F2 03 00 19 00 02 01 0F

	Modbus ID address	Function code	Starting address Hi	Starting address Lo	No. of register Hi	No. of register Lo	CRC	
Request [Hex]:	F2	03	00	19	00	02	01	0F

Response [Hex]: F2 03 04 29 00 41 C2 80 A1

	Modbus ID address	Function code	Byte count	Register 1 value Hi	Register 1 value Lo	Register 2 value Hi	Register 2 value Lo	CRC	
Response [Hex]:	F2	03	04	29	00	41	C2	80	A1

For decoding of float values (stored according standard IEEE754), please refer to AN0103, chapter 7.

### Example of decoding:

Response [Hex]:				Value in decimal
Byte 1 (Register 2 - Hi)	Byte 2 (Register 2 - Lo)	Byte 3 (Register 1 - Hi)	Byte 4 (Register 1 - Lo)	
41	C2	29	00	24,270019

## TECHNICAL DATA

(Modification rights reserved)

### Measured Values

#### Relative Humidity (RH)

Working range 0...100 % RH

RH accuracy<sup>1)</sup> (incl. hysteresis, non-linearity and repeatability)

Wall & duct version:

-15...40 °C (5...104 °F)	≤90 % RH	±(1.3 + 0.003*measured value) % RH
-15...40 °C (5...104 °F)	>90 % RH	± 2.3 % RH
-40...60 °C (-40...140 °F)		±(1.5 + 0.015*measured value) % RH

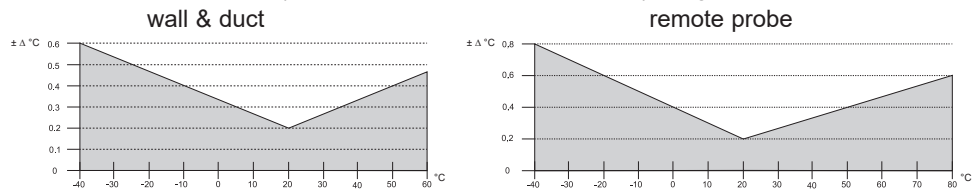
Remote probe version

at 20 °C (68 °F) ±2.5 % RH

#### Temperature (T)

Sensor Pt1000 (tolerance class B, DIN EN 60751) integrated in HCT01

T-accuracy



### Outputs

#### Analogue output

0-5 V / 0-10 V -1 mA < I<sub>L</sub> < 1 mA

4-20 mA (2-wire) R<sub>L</sub> ≤ 500 Ohm

0-20 mA (3-wire) R<sub>L</sub> ≤ 500 Ohm

#### Digital output

RS485 (BACnet MS/TP or Modbus RTU), max. 32 EE210 in one bus

### General

#### Power supply

for 4-20 mA, 2-wire 10 V + R<sub>L</sub> x 20 mA < V<sub>+</sub> < 30 V DC

for 0-20 mA, 3-wire 15-35 V DC<sup>2)</sup> or 24V AC ±20 %

for 0-5 V / 0-10 V / RS485

#### Current consumption at 24 V

Voltage output DC supply max. 12 mA; with display max. 23 mA  
AC supply max. 34 mA<sub>rms</sub>; with display max. 49 mA<sub>rms</sub>

#### Current output

2-wire DC supply max. 40 mA; with display max. 40 mA  
3-wire DC supply typ. 33 mA; with display max. 44 mA  
AC supply typ. 65 mA<sub>rms</sub>; with display max. 84 mA<sub>rms</sub>

#### Digital interface

DC supply typ. 5 mA; with display max. 20 mA  
AC supply typ. 15 mA<sub>rms</sub>; with display max. 35 mA<sub>rms</sub>

Display 1, 2 or 3 lines, user configurable, optional with backlight

Electrical connection Screw terminals, max. 1.5 mm<sup>2</sup>

Housing material Polycarbonate, UL94V-0 (with Display UL94HB) approved

Protection class IP65 / NEMA 4

Cable gland M16 x 1.5

Probe cable (type PC) PVC, Ø 4.3 mm, 4 x 0.25 mm<sup>2</sup>, Length: 1.5 or 3 m (4.9 or 9.8 ft)

Electromagnetic compatibility EN61326-1 EN61326-2-3



Industrial Environment

Temperature ranges Working: -40...60 °C (-40...140 °F) (-40...80 °C / -40... 176 °F for probe EE210P)

model without display Storage: -40...60 °C (-40...140 °F)

Temperature ranges with display Working: -20...50 °C (-4...122 °F) (-40...80 °C / -40... 176 °F for probe EE210P)

model with display Storage: -20...60 °C (-4...140 °F)

1) Traceable to intern. standards, administrated by NIST, PTB, BEV,... The accuracy statement includes the uncertainty of the factory calibration with an enhancement factor k=2 (2-times standard deviation). The accuracy was calculated in accordance with EA-4/02 and with regard to GUM (Guide to the Expression of Uncertainty in Measurement).

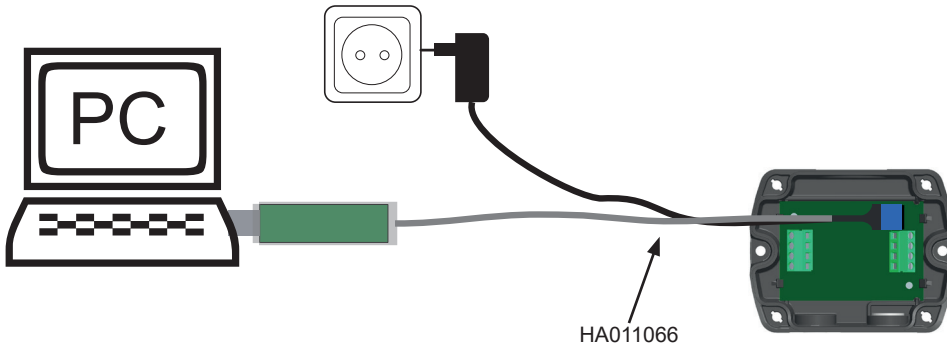
2) USA & Canada: class 2 supply required, max. supply voltage 30 V

## SETUP AND ADJUSTMENT

The EE210 is ready to use and does not require any configuration by the user. The factory setup of EE210 corresponds to the type number ordered. For ordering guide please see data sheet at [www.epluse.com/ee210](http://www.epluse.com/ee210). If needed, the user can change the factory setup by using the USB configuration adapter (cod HA011066) and the EE-PCS, Product Configuration Software.

The user can change the scaling and the analogue output signal, the digital settings and perform RH and T adjustment.

**Note:** The EE210 may not be connected to any additional power supply when using the USB configuration adapter HA011066.



## EE-PCS PRODUCT CONFIGURATION SOFTWARE

1. Download the EE-PCS Product Configuration Software from [www.epluse.com/configurator](http://www.epluse.com/configurator) and install it on the PC.
2. Connect the E+E device to the PC using the USB configuration adapter.
3. Start the EE-PCS software.
4. Follow the instructions on the EE-PCS opening page for scanning the ports and identifying the connected device
5. Click on the desired setup or adjustment mode from the main EE-PCS menu on the left and follow the online instructions of the EE-PCS

## MAINTENANCE

### Humidity calibration and adjustment:

Depending on the application and the requirements of certain industries, there might arise the need for periodical humidity calibration (comparison with a reference) or adjustment (bringing the device in line with a reference).

- Calibration and adjustment at E+E Elektronik  
Calibration and/or adjustment can be performed in the E+E Elektronik calibration laboratory. For information on the E+E capabilities in ISO or accredited calibration please see [www.eplusecal.com](http://www.eplusecal.com).
- Calibration and adjustment by the user  
Depending on the level of accuracy required, the humidity reference can be:
  - Humor 20 Humidity Calibrator, please see [www.epluse.com](http://www.epluse.com).
  - Omniport30 handheld device, please see [www.epluse.com/omniport30](http://www.epluse.com/omniport30).
  - Calibrated salt solutions, please see [www.epluse.com/EE210](http://www.epluse.com/EE210).

### Temperature calibration and adjustment:

Due to the outstanding protection of the Pt1000 temperature sensing element integrated in the E+E HCT01 sensor, a drift of the T measurement is rather unlikely. If adjustment seems necessary, although the user can perform a one or two point T adjustment with USB configuration adapter and EE-PCS against a reference of his choice, it is highly recommended to return the device to the manufacturer for this. The reasons rest on the difficulty of an accurate T calibration in the air. The calibration shall take into account the self-heating of EE210 with closed enclosure, in its real mounting position and in continuous operation, the impact of the output current and of the probe orientation to the self-heating, as well as the cooling effect of the air circulation in a climate chamber possibly used for calibration.

### When employed in dusty, polluted environment:

- The filter cap shall be replaced once in a while with an E+E original one. A polluted filter cap causes longer response time of the device.
- If needed, the sensing head can be cleaned. For cleaning instructions please see [www.epluse.com/EE210](http://www.epluse.com/EE210).

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**USA****FCC notice:**

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the installation manual, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

**CANADIAN****ICES-003 Issue 5:**

CAN ICES-3 B / NMB-3 B

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