

# User manual

Ver 1.3

## Change history

revision	Updated date	summary
1.0	Sep 14 2012	First edition
1.1	Sep 24 2012	Correction of erroneous description
1.2	Sep 25 2012	Correction of erroneous description(5.6 / 5.7)
1.3	Dec 05 2012	Addition of the AC input frequency(1,3.1,4.1)

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## 1. Application

This document shows the description of concentrator (CN) and relay equipment(RE)

No.	Equipment name	Equipment number	remarks
1	relay equipment	YA14A75-B310	Input voltage:120VAC 60Hz
2	concentrator	YA14A75-B311	
3	relay equipment	YA14A75-B312	Input voltage:240VAC 60Hz
4	concentrator	YA14A75-B313	

## 2. System Configuration

Fig2-1 is general system configuration.

Installed meters in each house is communicated to Center via RE and CN and control the meter-reading value etc. automatically.

This equipment must be professionally installed.

Red line of Fig.2-1 is the applicable scope of this document.

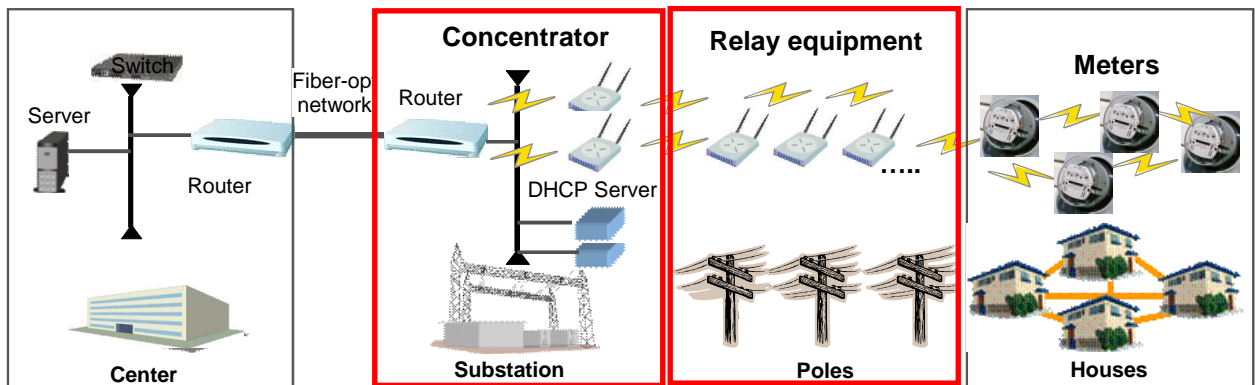


Fig2-1 System configuration

### 3. Description of GW/Rep

#### 3.1 Overview

Form and overview of CN and RE are as shown below.

Category	equipment		Remark
	CN	RE	
Input voltage	120VAC or 240VAC/60Hz	Same as on the left	The makeup of RE is same as GE. The differences are only installed software.
Frequency			
operational temperature range	-40°C~70°C		
enclosure	Refer to Fig.3-1		
Antenna	Refer to Fig.3-2		
AC cable	Refer to Fig.3-3		


RE and CN difference of firmware are as below.

Category	equipment		Remark
	CN	RE	
Inter-Server communication	applicable	NA	IEEE802.11n
RE-RE/GW communication	applicable	applicable	IEEE802.11n
Meter communication	applicable	applicable	IEEE802.11b
Relay function	NA	applicable	Application

#### 3.2 Operating Range

- Voltage :  $\pm 20\%$
- Temperature : -40°C through +70°C
- Typical Starting Watts :  $\leq 4.7$ Watts (Input voltage:120VAC/240VAC)

#### 3.3 Antenna Specifications



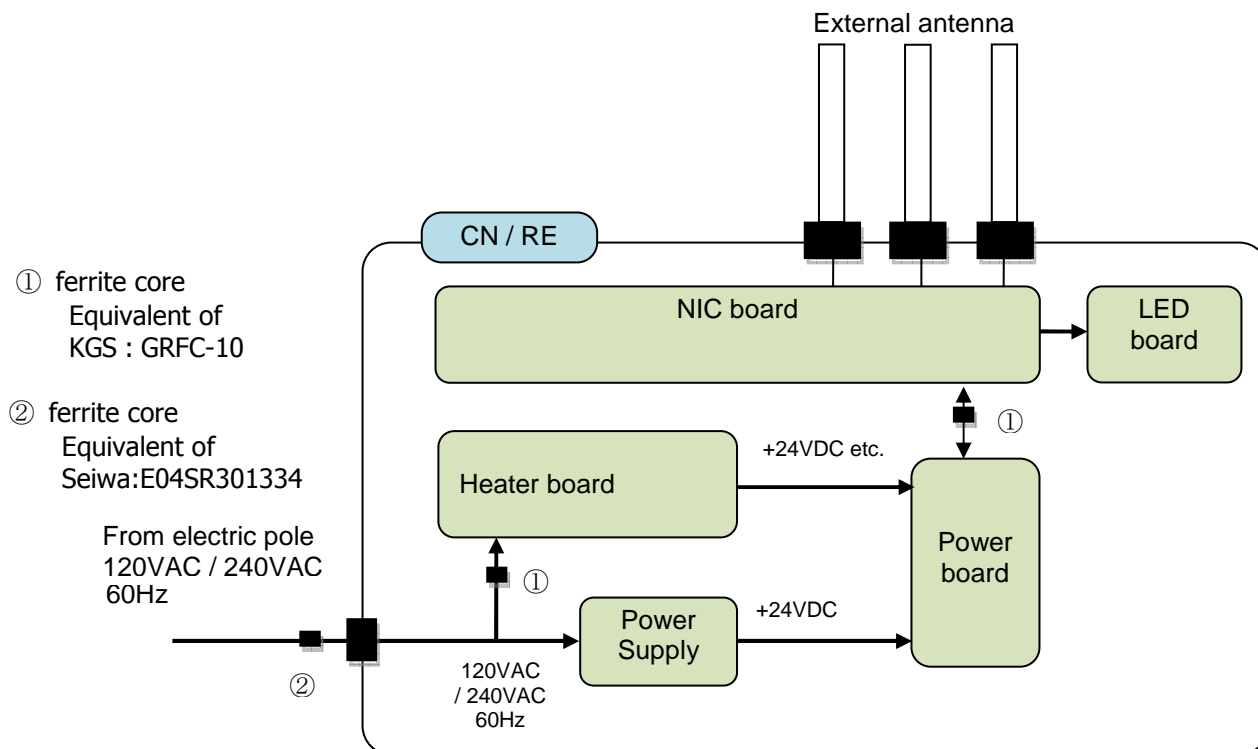
Frequency Range	2400MHz - 2500MHz
V.S.W.R (MAX)	1.3 :1
Antenna Type	Collinear
Radiation	Omni Directional
Gain (MAX)	8 dBi
Polarization	Vertical
Maximum Power	50 Watts
Vertical Beam-with	12 Deg
Horizontal Beam-with	360 Deg
Impedance	50 Ohm
Antenna Design	Dipole Array
Internal Material	Copper
Connector	N-Male

AOA-2408M

## 4. Description of Internal components

### 4.1 Overview

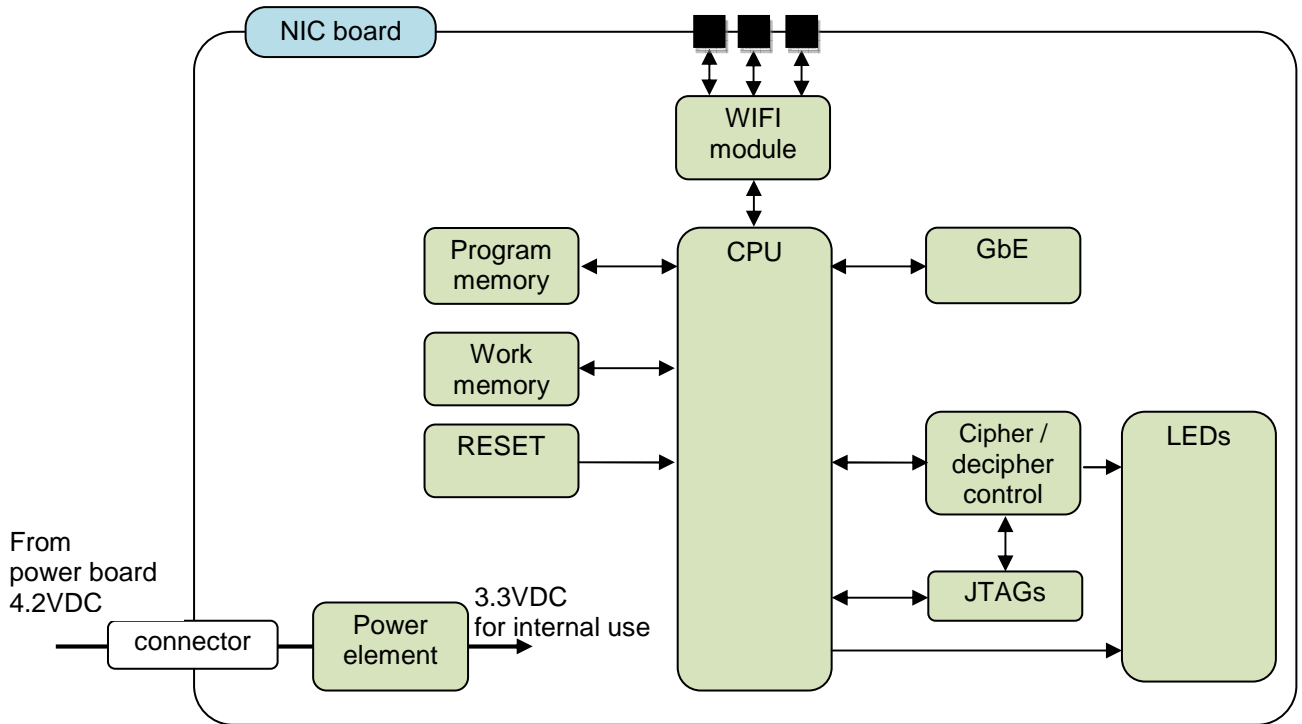
The CN/RE is composed of 4 board(NIC board / power board / heater board / LED board) and AC/DC power supply.



No.	component	summary	remark	
1	NIC board	Wireless specification •IEEE 802.11b/n (20MHz) •Transmission power:210mW •Modulation :DSSS(DBPSK)-OFDM •Data Rate : - for CN and RE : IEEE 802.11n, 26Mbps (fixed) - for CN and RE (broadcast) : IEEE 802.11n, 6.5Mbps (fixed) -For RE (communication with meter) : IEEE 802.11b, 1Mbps (fixed)		
2	Power board	•power feeding for NIC board. - Input:24VDC / Output:4.2VDC •Supervision of AC power discontinuity.		
3	Heater board	•guarantee of working in cool environment(-40°C~).		
4	LED board	extinction	power off or no service (reset / start-up firmware)	LED(green)
		blinking	No operation ( no communication)	
		lighting	normal operation	
		extinction	normal	LED(orange)
		blinking	Tamper detection or boot error	
		lighting	NIC(Cipher/Decipher element) fault	
		unused	LED(Red)	
5	Power supply	*AC cable is connected to this element. *This element steps down AC input(120V/240V) to +24VDC. * Power consumption: - Input : 120V/240VAC(60Hz) – 80W(max),5.0W(ave) - Output : 24VDC – 40W(max),5.0W(ave)		
6	Antenna	2.4~2.5GHz 8dBi mesh omni antenna		

### 4.1.1 NIC board

Major elements of NIC board are as shown below.



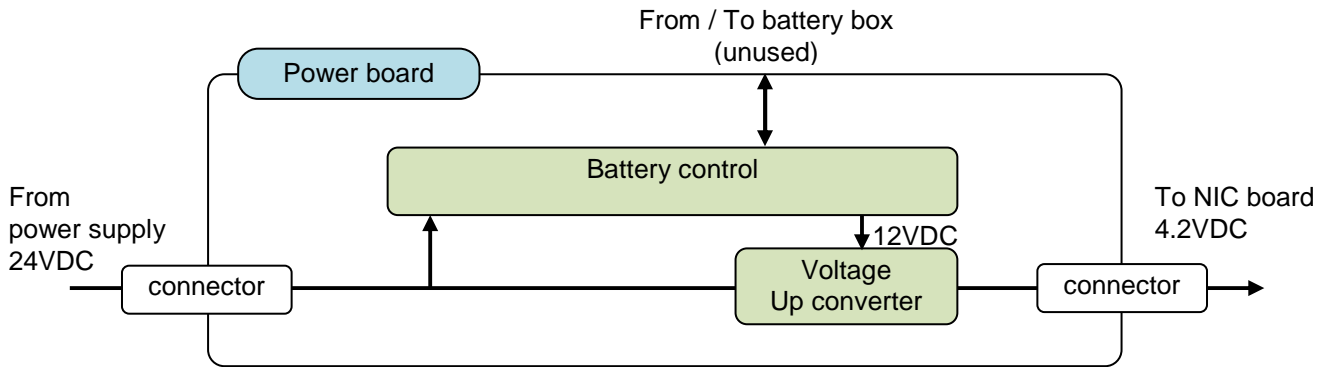
Details of the element of NIC board are as shown below.

No.	element	summary	remark
1	WIFI module	MAC/baseband/radio and wireless access point. IEEE802.11b/n 3x3 MIMO - reference clock – 100MHz(PCI Express Interface) - 3.3V – for main element - 4.2V – for power amp	
2	Cipher / decipher control	This element handles cipher/decipher processing by using fixed key. And, target information are time information come from wireless and program use internal process.	
3	CPU	32bit processor / 400MHz	
4	Program memory	Stored the program of ADHOC	
5	Work memory	Work memory	
6	GbE	Unused	
7	JTAGs	For program writing.	
8	RESET	Power on reset / reset switch	
	LEDs	Equipment status indication refer to table of 4.1	
9	Power element	This element convert 4.5VDC to 3.3V power supply for internal use.	

Operating range : Same as chapter 3.2.

### 4.1.2 Power board

Major elements of power board are as shown below..



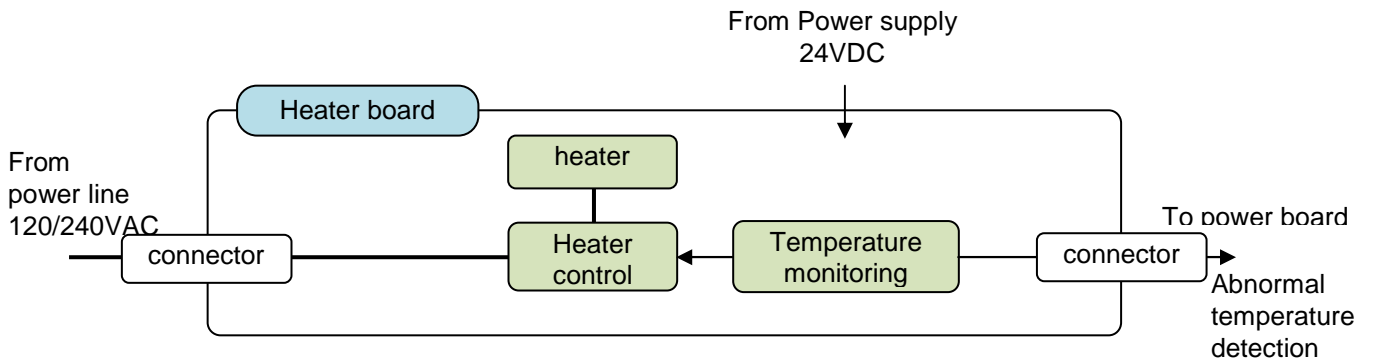
Details of the element of NIC board are as shown below.

No.	element	summary	remark
1	Battery control	- external battery charge/discharge control. - temperature monitoring of battery box.	unused
2	Voltage down converter	- Diode bridge for detecting 12V/24V. - This element convert 12/24VDC to 4.2V power supply for NIC board.	

Operating range : Same as chapter 3.2.

### 4.1.3 Heater board

Major elements of heater board are as shown below..



Details of the element of heater board are as shown below.

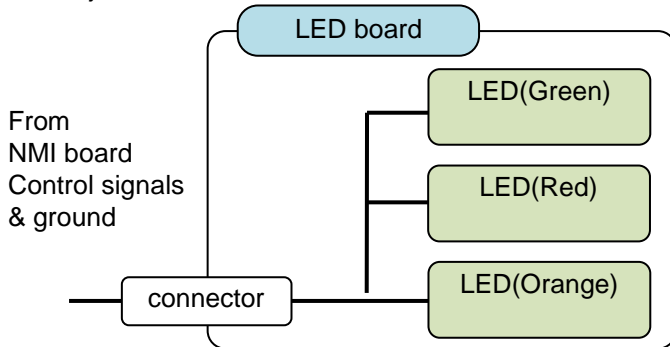
No.	element	summary	remark
1	Temperature monitoring	temperature monitoring of wireless board.	
2	Heater control	Heater control element observes the state of temperature monitoring element, and guarantees operating temperature of the equipment by energizing to the heater at the low temperature.	
3	heater	Use of cement resistor	
4			

Operating range : Same as chapter 3.2.



### 4.1.4 LED board

Major elements of LED board are as follows.



Details of the element of NIC board are shown below.

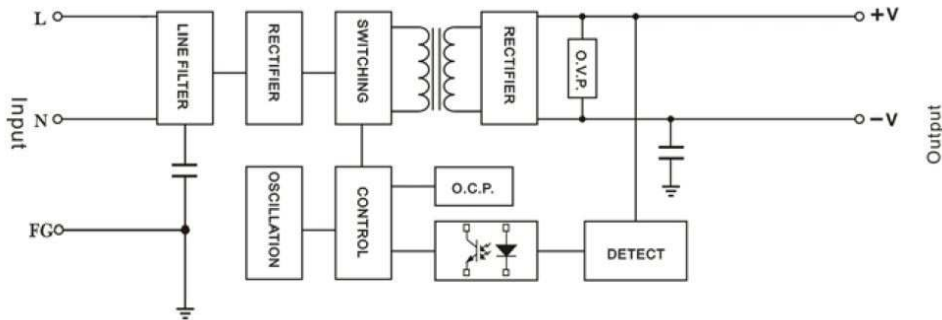
No.	element	summary	remark
1	LED(Green)	Refer to table of 4.1.	RUN
2	LED(Red)		AL0
3	LED(Orange)		AL1

Operating range : Same as chapter 3.2.

### 4.1.5 Power supply

AC power supply mounted to this equipment is a marketed product.

Single Output



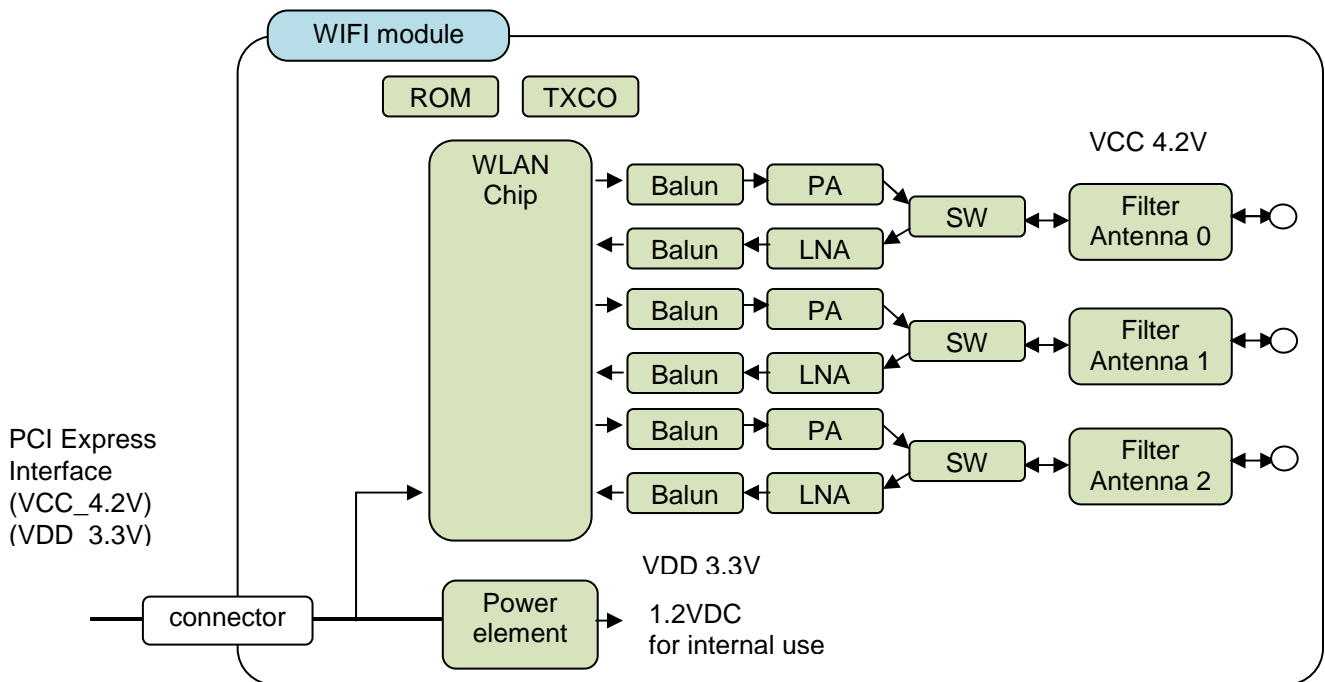
Specification of power supply are as shown below.

No.	category	summary	
1	Max output wattage (W)	60W	
2	Input	voltage	85-265 VAC
3		Frequency(Hz)	47-63Hz
4		Current (Full road)	2A max (115VAC) / 1A max (230VAC)
5		Inrush current (<2ms)	30 A max (115VAC) / 50A max (230VAC)
6		Leakage current	0.5mA max
7		output	Voltage (VDC)
8	Voltage accuracy		±2%
9	Current(mA) max		2500
10	ripple		<0.2% volt +40mV max(V <sub>p-p</sub> )
11	noise		<0.5% volt +50mV max(V <sub>p-p</sub> )
12	Efficiency (at 230V)		86%
13	Switching frequency		100KHz

Operating range : Same as chapter 3.2.

## 4.1.6 WIFI module

Major elements of WIFI module are as follows.



Details of the element of WIFI module are shown below.

No.	element	summary	remark
1	WRAN Chip	3x3 Spatial Stream MIMO WLAN Radio Chip	
2	Balun	Balanced to unbalanced	
3	PA	Power amplifiers	
4	LNA	Low noise amplifiers	
5	SW	RF Switch	
6	Filter Antenna	RF Band pass filter	
7	Power element	This element convert 3.3VDC to 1.2V power supply for internal use.	
8	ROM	MAC Configuration TOP Memory	
9	TXCO	Temperature Compensated Crystal Oscillator	

Operating range : Same as chapter 3.2.

## 5. Required FCC and IC statement ( Host )

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

- (1) this device may not cause harmful interference, and
- (2) this device must accept any interference received, including interference that may cause undesired operation.

### 5.1 FCC §15.21

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

### 5.2 FCC §15.105

For class B equipment:

NOTE:

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 instructions, 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.

### 5.3 RSS-Gen §7.1.2.

Under Industry Canada regulations, this radio transmitter may only operate using an antenna of a type and maximum (or lesser) gain approved for the transmitter by Industry Canada. To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than that necessary for successful communication.

Conformément à la réglementation d'Industrie Canada, le présent émetteur radio peut fonctionner avec une antenne d'un type et d'un gain maximal (ou inférieur) approuvé pour l'émetteur par Industrie Canada. Dans le but de réduire les risques de brouillage radioélectrique à l'intention des autres utilisateurs, il faut choisir le type d'antenne et son gain de sorte que la puissance isotrope rayonnée équivalente (p.i.r.e.) ne dépasse pas l'intensité nécessaire à l'établissement d'une communication satisfaisante.

### 5.4 RSS-Gen §7.1.3.

This device complies with Industry Canada licence-exempt RSS standard(s). Operation is subject to the following two conditions:

- (1) this device may not cause interference, and
- (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes:

- (1) l'appareil ne doit pas produire de brouillage, et
- (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

## 5.5 Indicating safe separation distance warning

This equipment complies with radio frequency exposure limits set forth by the FCC and Industry Canada for an uncontrolled environment. This equipment should be installed and operated with a Minimum distance of 20cm between the device and the user or bystanders. This device must Not be co-located or operating in conjunction with any other antenna or transmitter.

Cet équipement est conforme aux limites d'exposition aux radiofréquences définies par la FCC et Industrie Canada pour un environnement non contrôlé. Cet équipement doit être installé et utilisé avec un minimum de 20 cm de distance entre le dispositif et l'utilisateur ou des tiers. Ce dispositif ne doit pas être utilisé a proximité d'une autre antenne ou d'un autre émetteur.

## 5.6 Indicating compliance with ICES-003

This Class B digital apparatus complies with Canadian ICES-003.

Cet appareil numérique de la classe B est conforme à la norme NMB-003 du Canada.

## 5.7 Indicating compliance with RSS-Gen §7.1.2.

This radio transmitter IC: 10402A-12002SNB has been approved by Industry Canada to operate with the antenna types listed below with the maximum permissible gain and required antenna impedance for each antenna type indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device..

Antenna type: collinear antenna, gain: 8 dBi, impedance: 50 ohm

Le présent émetteur radio IC: 10402A-12002SNB a été approuvé par Industrie Canada pour fonctionner avec les types d'antenne énumérés ci-dessous et ayant un gain admissible maximal et l'impédance requise pour chaque type d'antenne. Les types d'antenne non inclus dans cette liste, ou dont le gain est supérieur au gain maximal indiqué, sont strictement interdits pour l'exploitation de l'émetteur.

Type d'antenne: antenne colinéaire, gain: 8 dBi, impédance : 50 ohm