IPPAN4
Installation Manual

Version 1.0
May 2020

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1.0 OVERVIEW

Thank you for choosing the IPPAN4 module by Wattstopper. This manual will guide you through the process of installing the module.

IPPAN4 embeds wireless IPv6-based communication into each Wattstopper or host device, and uses wireless mesh networking technology to connect to the internet. Each IPPAN4 module has a unique IPv6 address and “smart” functionality which enables wireless data gathering, communication, and control of the host device.

The IPPAN4 module is designed to be a self-contained IEEE® 802.15.4 and BLE compliant wireless interface to be employed in conjunction with a variety of daughter boards that maintain a stable 2.1-3.3Vdc supply. IPPAN4 provides a diverse set of I/O options such as serial interface or general purpose I/O. IPPAN4 is comprised of a microcontroller, transceiver, amplifier, and two antennas.

2.0 IPPAN4 MODULE

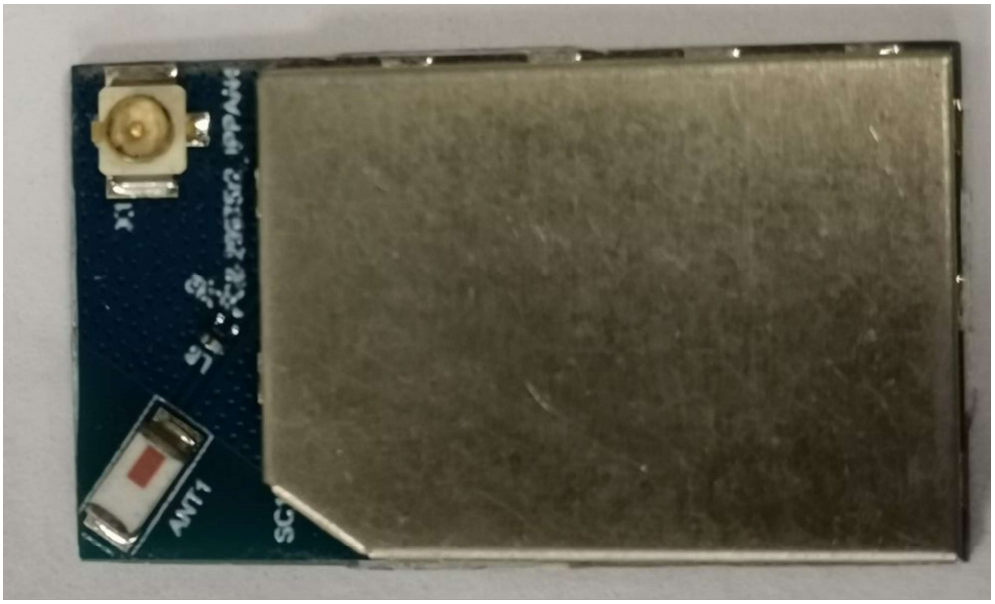

FIG 1.0

2.1 SPECIFICATIONS

Specification	IPPAN4
Performance	
Tuning Range	Internally calibrated for the selected IEEE channel
Data Rate	250kb/s
Max 802.15.4 Radio Output Power	16.4dBm
Max BLE Radio Output Power	2.0dBm
802.15.4 Receiver Sensitivity	-101dBm
BLE Receiver Sensitivity	-96 dBm
Power Requirements	
VCC	2.0 - 3.3Vdc, 0.3A
General	
Dimensions	2.8 x 15 x 26 mm (H x W x D)
Operating Temperature	-30° C to + 60° C
Humidity	90% RH (max), non-condensing
Agency Approval	
United States (FCC, 15.247)	Q4B-P4
Industry Canada (IC)	21161-P4

FIG 2.0

2.2 PIN SIGNAL

3v3/VCC	P01	PWR	SPI	P19	EXT_SPI_CLK
Ext_SPI_CS	P02	SPI		P20	Spare (HI f)
SWDCLK	P03	PRG	ADC	P21	AIN3
FLASH_SELECT	P04	Ispi	SPI	P22	EXT_SPI_MISO
SWDIO	P05	PRG	SER	P23	UART_DIN
GPIO_6	P06	DIO	SER	P24	UART_DOUT
RESET	P07	RST	ADC	P25	AIN2
I2C_DATA	P08	I2C	ADC	P26	AIN1
I2C_CLK	P09	I2C	RAD	P27	CTX
CRYPTO_IC_DATA	P10	I2C	ADC	P28	AIN0
IN_BUS_MISO	P11	Ispi	DIO	P29	GPIO_4
CRYPTO_IC_CLK	P12	I2C		P30	Spare (<10kHz)
GND	P13	GND	DIO	P31	GPIO_1
IN_BUS_MOSI	P14	Ispi	RAD	P32	CSD
GPIO_2	P15	DIO	RAD	P33	Amp_Bypass/NFC2
IN_SCLK	P16	Ispi	RAD	P34	Sleep_Amp/NFC1
EXT_SPI_MOSI	P17	SPI	DIO	P35	GPIO_5
GPIO_0	P18	DIO	RAD	P36	RADIO_ANT_SEL

FIG 3.0

PIN #	NAME	DESCRIPTION
1	3v3/VCC	Voltage Supply
2	EXT_SPI_CS	Ext SPI CS or General Purpose Input/Output
3	SWDCLK	SWD Clock
4	FLASH_SELECT	IN BUS SPI CS
5	SWDIO	SWD Data
6	GPIO_6	General Purpose Input/Output
7	RESET	Module Inverted Reset
8	I2C_DATA	I2C Data
9	I2C_CLK	I2C Clock
10	CRYPTO_IC_DATA	Ext I2C Data

11	IN_BUS_MISO	IN BUS SPI Master Input → Slave Output
12	CRYPTO_IC_CLK	Ext I2C Clock
13	GND	Ground
14	IN_BUS_MOSI	IN BUS SPI Master Output → Slave Input
15	GPIO_2	General Purpose Input/Output
16	IN_SCLK	IN BUS SPI SCLK
17	EXT_SPI_MOSI	Ext SPI Master Output → Slave Input
18	GPIO_0	General Purpose Input/Output
19	EXT_SPI_CLK	Ext SPI Clock
20	Spare (HI f)	General Purpose Input/Output (High Frequency)
21	AIN3	Analog to Digital Converter or Pulse Width Modulation or General Purpose Input/Output
22	EXT_SPI_MISO	Ext SPI Master Input → Slave Output
23	UART_DIN	Serial UART In
24	UART_DOUT	Serial UART Out
25	AIN2	Analog to Digital Converter or Pulse Width Modulation or General Purpose Input/Output
26	AIN1	Analog to Digital Converter or Pulse Width Modulation or General Purpose Input/Output
27	CTX	Radio mode control
28	AIN0	Analog to Digital Converter or Pulse Width Modulation or General Purpose Input/Output
29	GPIO_4	General Purpose Input/Output
30	Spare (<10kHz)	General Purpose Input/Output (Low Frequency)
31	GPIO_1	General Purpose Input/Output
32	CSD	Radio mode control
33	Amp_Bypass/NFC2	Front End Bypass or Near-Field Communication
34	Sleep_Amp/NFC1	Radio sleep control or Near-Field Communication
35	GPIO_5	General Purpose Input/Output
36	RADIO_ANT_SEL	Radio control antenna switch

FIG 4.0

2.3 Antennas

The IPPAN4 module can have two antennas. The ceramic antenna has a gain less than 0.5dBi, and the external antenna can use different antenna base on different Wattstopper product . but the gain not higher than 4.0dBi.

2.4 Operating Channels

IPPAN4 provides a wide range of channels.

IEEE 802.15.4 Operating Channels	Operating Frequency [GHz]
11	2.405
12	2.410
13	2.415
14	2.420
15	2.425
16	2.430
17	2.435
18	2.440
19	2.445
20	2.450
21	2.455
22	2.460
23	2.465
24	2.470
25	2.475
26	2.480

FIG 5.0

3.0 Modes of Operation

The final use and application of IPPAN4 is dependent on the firmware pre-installed at the factory. However, all applications have common modes of operations that can be summarized as follows for both the IEEE® 802.15.4 and BLE radios**:**

NOTE: IEEE® 802.15.4 can be used only when BLE is not in use.

Idle Mode
IPPAN4 enters idle mode of operation whenever the device is not in transmit, or receive mode, or when there is no data to process.

Data Processing Mode
When an interrupt, timer, frame reception, or frame transmission event occurs IPPAN4 moves out of idle mode and into data processing mode. In this mode IPPAN4 can processes information and act on data accordingly.

Receive Mode
When a 802.15.4, or BLE, compliant message is received by the transceiver and it's either addressed for IPPAN4 or broadcast the device can be said to be in receive mode. In receive mode IPPAN4 validates data and address before accepting the message for processing.

Transmit Mode
In this mode IPPAN4 generates an 802.15.4, or BLE, compliant message that can be sent directly to another IPPAN4 or broadcast to all other IPPAN4 modules within radio range. Transmission mode is preceded by user interaction, a data logging event, a network maintenance message or as a response to a message acknowledgement request.

4.0 INSTALLATION

IPPAN4 will come pre-programmed from the manufacturer, and in many cases pre-installed in a device. If you have elected to install IPPAN4 in house, it is important to understand how to handle, install, and use properly.

4.1 DESIGN GUIDELINES

- The IPPAN4 Module is designed either to be surface mounted.
- Standard electrostatic discharge precautions should be taken when handling the module.
- The radiating structures (antenna) are away from other sensitive electronics
- No antenna modifications can be made (see section 5.0)
- FCC labeling guidelines must be maintained (see section 5.0)
- All stated electrical maximum and minimum values must be met (see section 2.1)

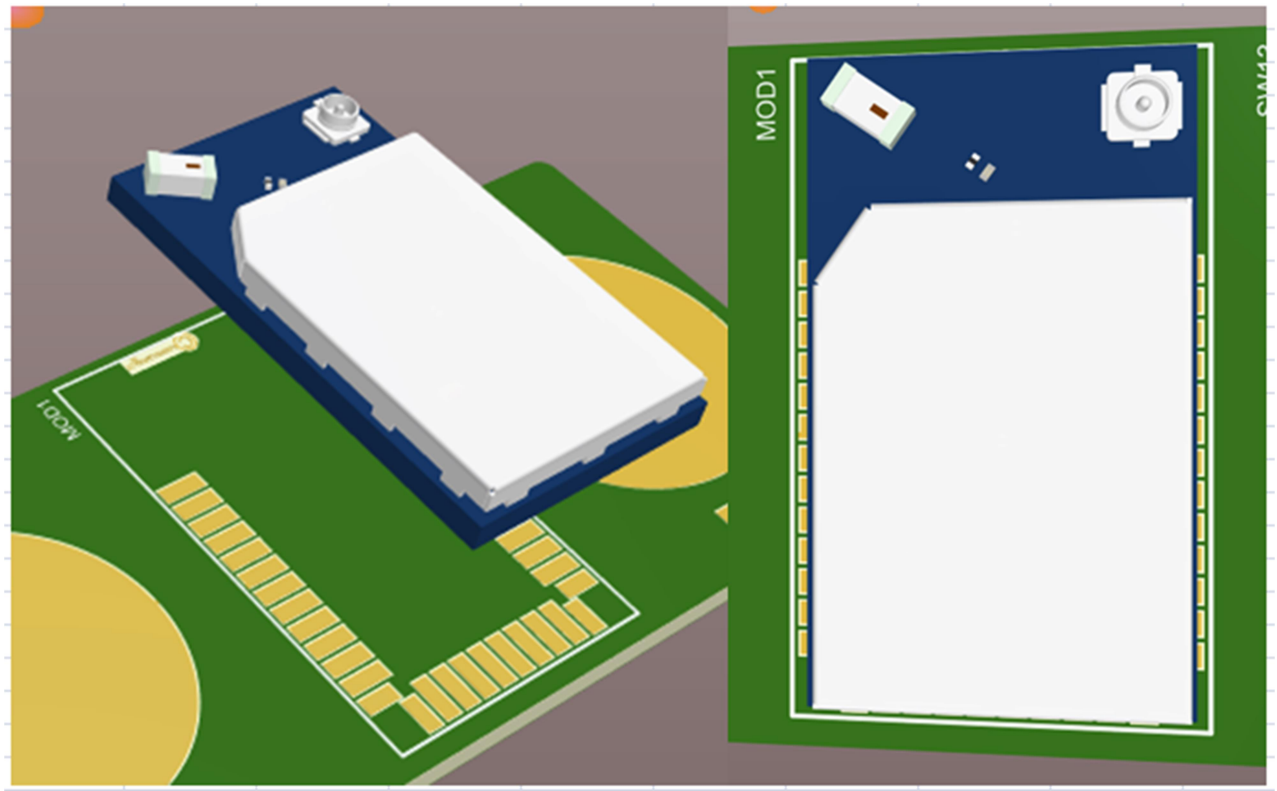

FIG 6.0

4.2 END USER GUIDELINES

The module is designed to be used in fixed locations. If the end user experiences communication problems it is recommended to move the transceivers closer to one another or purchase a repeater.

Objects including, but not limited to, steel reinforced walls, metal electrical boxes, water, and snow may degrade the working distance between transceivers, and should be avoided. IPPAN4 is designed to operate in a mesh network, and in most cases adding nodes can help overcome communication issues.

FCC requires specific text to be placed within user's manual or operator instruction guide for the final commercial product. Specific details on this text can be found in section 5.0.

5.0 AGENCY CERTIFICATIONS

Operating Requirements and Conditions
The design of IPPAN4 complies with FCC and IC safety levels of radio frequency (RF) exposure for Mobile devices.

Mobile Device RF Exposure Statement
RF Exposure - This device is only authorized for use in a mobile application. At least 20 cm of separation distance between the IPPAN4 device and the user's body must be maintained at all times.

Caution Statement for Modifications
CAUTION: Any changes or modifications not expressly approved by Wattstopper could void the user’s authority to operate the equipment.

FCC Notices
IPPAN4 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 an 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 IPPAN4 off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- 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 for help.

You must include the following text in final commercial product manual:

The enclosed 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

This device complies with Part 15, Subpart C, Section 15.247 of the FCC Rules,This device IPPAN4 should not collocate with other radio.

Exigences et conditions de fonctionnement:
La conception de IPPAN4 est conforme aux limites d'exposition aux Frequences Radio définies par les normes IC et FCC pour les appareils mobiles.

Déclaration d'exposition aux fréquences radio d'appareil mobile
Exposition fréquences radio - Cet appareil est seulement conçu pour usage mobile. Au moins 20 cm de séparation doit être maintenue à tout instant entre l'appareil IPPAN4 et l'utilisateur.

Déclaration de mise en garde concernant les modifications
ATTENTION: Tous changements ou modifications qui ne sont pas expressément approuvés par Wattstopper sont susceptibles de révoquer les droits d'utilisation de cet équipement.

Avis IC
IPPAN4 a été testé et entre dans la catégorie des appareils numériques de Classe B, selon la Section 15 de la réglementation de la IC. Ces limites ont été conçues pour protéger les installations domestiques contre les interférences néfastes. Cet équipement génère, utilise et émet de l'énergie sous forme de fréquences radio et, en cas de non-respect des instructions d'installation et d'utilisation, risque de provoquer des interférences radio. Il n'existe cependant aucune garantie contre ces interférences.

En cas d'interférences radio ou télévisuelles, pouvant être vérifiées en allumant, puis en éteignant l'équipement, l'utilisateur est invité à essayer de résoudre le problème de l'une des façons suivantes :

- Eloigner l'équipement du poste de réception ;
- Brancher l'équipement sur une prise appartenant à un circuit différent de celui du récepteur ;
- Demander de l'aide auprès du revendeur ou d'un technicien radio/TV

6.0 OEM Labeling Requirements

WARNING! The Original Equipment Manufacturer (OEM) must ensure that FCC/IC labeling requirements are met. This includes a clearly visible label on the outside of the final product enclosure that displays the contents shown below.

FCC:

Contains FCC ID: Q4B-P4

IC:

Contains IC: 21161-P4

Exigences en matière d'étiquetage OEM :

ATTENTION! Le fabricant d'équipement d'origine (OEM) doit veiller à ce que les exigences en matière d'étiquetage de la FCC / IC soient respectées. Cela comprend une étiquette clairement visible sur l'extérieur de l'enceinte du produit final qui affiche le contenu ci-dessous.

FCC:

Contient FCC ID: Q4B-P4

IC:

Contient IC: 21161-P4

7.0 END USER LICENSE AGREEMENT

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