



THE ENERGY OF THINGS

IPPAN3
Installation Manual

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1.0 OVERVIEW

Thank you for choosing the IPPAN3 module by Amatis Controls, LLC. This manual will guide you through the process of installing the module.

IPPAN3 embeds wireless IPv6-based communication into each Amatis or host device, and uses wireless mesh networking technology to connect to the internet. Each IPPAN3 module has a unique IPv6 address and “smart” functionality which enables wireless data gathering, communication, and control of the host device.

The IPPAN3 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. IPPAN3 provides a diverse set of I/O options such as serial interface or general purpose I/O. IPPAN3 is comprised of a microcontroller, transceiver, amplifier, and three antennas.

2.0 IPPAN3 MODULE

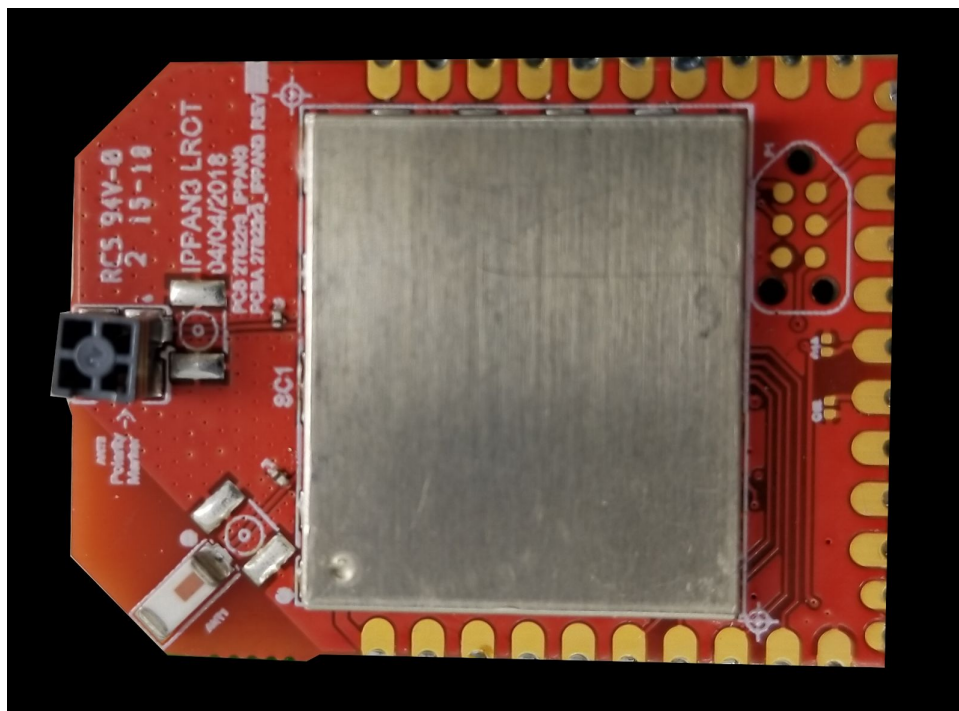


FIG 1.0

2.1 SPECIFICATIONS

Specification	IPPAN3
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	5.7 x 24.3 x 33 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)	2ADDY-P3
Industry Canada (IC)	20256-P3

FIG 2.0

2.2 PIN SIGNALS

3v3/VCC	P01	PWR		ADC	P32	AIN3
UART_DOUT	P02	SER		ADC	P31	AIN2
UART_DIN	P03	SER		ADC	P30	AIN1
GPIO_4	P04	DIO		ADC	P29	AIN0
RESET	P05	RST		DIO	P28	GPIO_1
EXT_SPI_MISO	P06	SPI		DIO	P27	GPIO_3
EXT_SPI_CLK	P07	SPI		I2C	P26	I2C_CLK
GPIO_0	P08	DIO		I2C	P25	I2C_DATA
EXT_SPI_MOSI	P09	SPI		SPI	P24	EXT_SPI_CS
GND	P10	GND		DIO	P23	GPIO_5
SPARE(<10kHz)	P11			DIO	P22	GPIO_2
SPARE(HI f)	P12			PRG	P21	SWDIO
IN_SCLK	P13	iSPI		PRG	P20	SWDCLK
IN_BUS_MOSI	P14	iSPI		DIO	P19	GPIO_6
IN_BUS_MISO	P15	iSPI		RAD	P18	CTX
SLEEP_AMP/NFC1	P16	iSPI		RAD	P17	AMP_BYPASS/NFC2

FIG 3.0

PIN #	NAME	DESCRIPTION
1	3v3/VCC	Voltage Supply
2	UART-DOUT	Serial UART Out
3	UART-DIN	Serial UART In
4	GPIO_4	High Drive General Purpose Input/Output
5	RESET	Module Inverted Reset
6	EXT_SPI_MISO	SPI Master Input → Slave Output
7	EXT_SPI_CLK	SPI Clock
8	GPIO_0	General Purpose Input/Output
9	EXT_SPI_MOSI	SPI Master Output → Slave Input
10	GND	Ground
11	SPARE(<10kHz)	General Purpose Input/Output (Low Frequency)
12	SPARE(HI f)	General Purpose Input/Output (High Frequency)
13	IN_SCLK	General Purpose Input/Output
14	IN_BUS_MOSI	SPI Master Output → Slave Input
15	IN_BUS_MISO	SPI Master Input → Slave Output
16	SLEEP_AMP/NFC1	Radio sleep control or Near-Field Communication
17	AMP_BYPASS/NFC2	Front End Bypass or Near-Field Communication
18	CTX	General Purpose Input/Output (Low Frequency)
19	GPIO_6	General Purpose Input/Output
20	SWDCLK	SWD Clock
21	SWDIO	SWD Data
22	GPIO_2	General Purpose Input/Output
23	GPIO_5	General Purpose Input/Output
24	EXT_SPI_CS	SPI CS or General Purpose Input/Output
25	I2C_DATA	I2C Data
26	I2C_CLK	I2C Clock
27	GPIO-3	General Purpose Input/Output
28	GPIO_1	General Purpose Input/Output
29	AtoD PWM GPIO	Analog to Digital Converter or Pulse Width Modulation or General Purpose Input/Output
30	AtoD PWM GPIO	Analog to Digital Converter or Pulse Width Modulation or General Purpose Input/Output
31	AtoD PWM GPIO	Analog to Digital Converter or Pulse Width Modulation or General Purpose Input/Output
32	AtoD PWM GPIO	Analog to Digital Converter or Pulse Width Modulation or General Purpose Input/Output

FIG 4.0

2.3 Antennas

The antennas on IPPAN3 are integrated into the PCB and to meet FCC regulations cannot be modified. The ceramic antenna has a gain less than 0.5dBi, and the helical antenna has a gain of less than 3dBi. IPPAN3 uses spatial diversity and a proprietary algorithm to select between one ceramic antenna and the helical antenna, to choose the one with the best performance characteristics. There is only one ceramic antenna for BLE transmissions.

2.4 Operating Channels

IPPAN3 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

FIG 5.0

3.0 Modes of Operation

The final use and application of IPPAN3 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

IPPAN3 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 IPPAN3 moves out of idle mode and into data processing mode. In this mode IPPAN3 can process 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 IPPAN3 or broadcast the device can be said to be in receive mode. In receive mode IPPAN3 validates data and address before accepting the message for processing.

Transmit Mode

In this mode IPPAN3 generates an 802.15.4, or BLE, compliant message that can be sent directly to another IPPAN3 or broadcast to all other IPPAN3 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

IPPAN3 will come pre-programmed from the manufacturer, and in many cases pre-installed in a device. If you have elected to install IPPAN3 in house, it is important to understand how to handle, instal, and use properly.

4.1 DESIGN GUIDELINES

- The IPPAN3 Module is designed either to be surface mounted or to mount into a standard 20 pin footprint using the following sockets:
 - Samtec P/N: MMS-110-01-L-SV
 - Samtec P/N: SMM-110-02-SM-S
- Standard electrostatic discharge precautions should be taken when handling the module.
- The socket should be designed in a manner where 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)

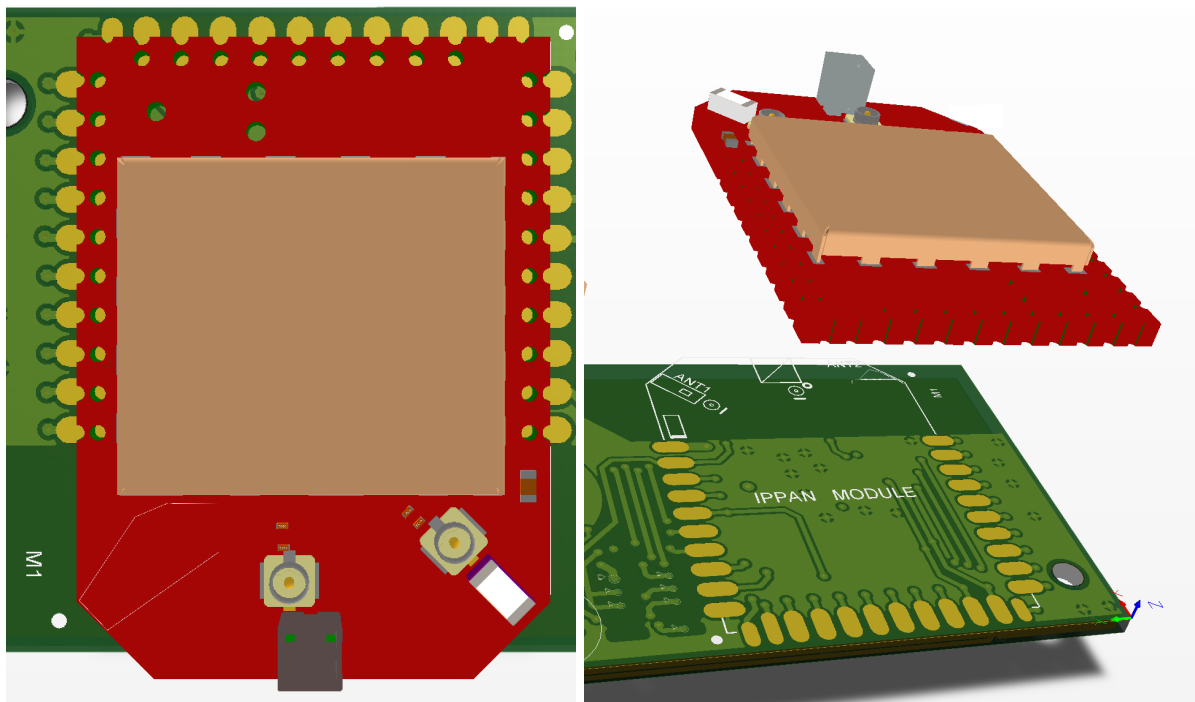


FIG 6.0

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. IPPAN3 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 IPPAN3 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 IPPAN3 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 *Amatis Controls, LLC* could void the user's authority to operate the equipment.

FCC Notices

IPPAN3 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 IPPAN3 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

Exigences et conditions de fonctionnement:

La conception de IPPAN3 est conforme aux limites d'exposition aux Fréquences 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 IPPAN3 et l'utilisateur.

Déclaration de mise en garde concernant les modifications

ATTENTION: Tous changements ou modifications qui ne sont pas expressément approuvés par *Amatis Controls, LLC* sont susceptibles de révoquer les droits d'utilisation de cet équipement.

Avis IC

IPPAN3 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: 2ADDY-P3

IC:

Contains IC:20256-P3

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: 2ADDY-P3

IC:

Contient IC:20256-P3

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