Rhein Tech Laboratories
360 Herndon Parkway, Ste 1400
Herndon, VA 20170
http://www.rheintech.com

Client: IWT
Model: AXON™ Module
FCC ID: SP8-IWTBB1142
Standard: FCC 15.247

APPENDIX I: MANUAL

Please refer to the following pages.

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AXON™ USER MANUAL

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.

FCC ID: SP8-IWTBB1142

IMPORTANT NOTE: To comply with FCC RF exposure compliance requirements, the antenna used for this transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

Changes or modifications to this unit not expressly approved by Innovative Wireless Technologies, Inc. could void the user's authority to operate this equipment.

Innovative Wireless Technologies, Inc.
1047 Vista Park Drive, Suite A
Forest, Virginia 24551

1-434-316-5230 (United States)
www.iwtwireless.com (United States)

AXON™ and Synaptrix™ are registered in the US Patent & Trademark Office.

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Overview

IWT's Module is a 2.4 GHz transceiver module that offers an embedded 16-bit RISC CPU and is designed to comply with IEEE's 802.15.4 physical layer specifications. The module offers the user a compact size, ruggedized connections, and an on-board antenna.   The module is designed to work with your sensor applications by offering UART communications, 3 general-purpose I/O ports, one 12-bit Analog-to-Digital port, and a SPI compatible interface to operate a peripheral device. The module also offers a 6MHz and a 32.768kHz watch crystal for your timing needs.

The AXON™ Module is Synaptrix™ ready and ZigBee™ ready. Synaptrix™ is IWT's mesh-networking software stack.

Interfaced to the programmer board, the module offers a practical design environment that allows for fast debug and easy access to the programmable interfaces.
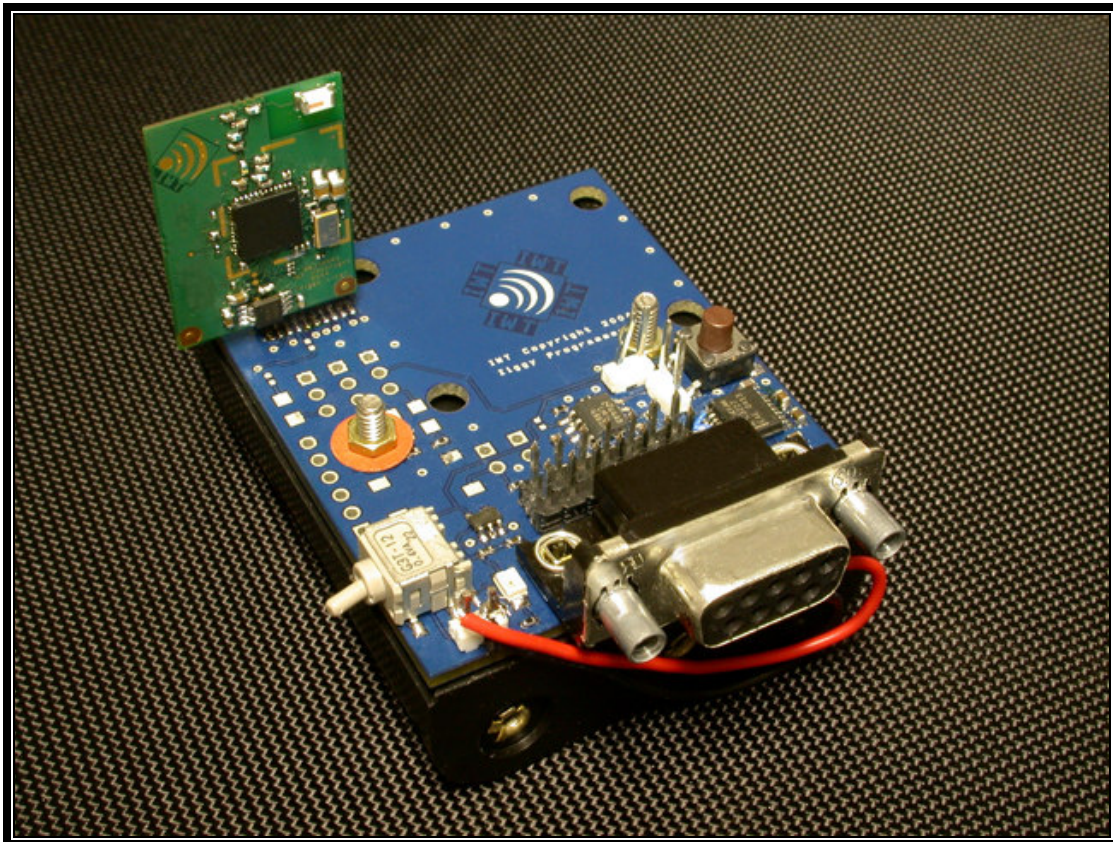

Figure 1 - Axon module with programming board

FCC Statement for OEM Integrators

AXON™ Module Use for maintaining RF exposure

This device is intended only for OEM integrators under the following conditions:

1. Connection to the AXON™ Module should always be made through the 20 pin header. Connection to the AXON™ Module any other way not expressed in this documentation or approved by Innovative Wireless Technologies, Inc. will void the user's ability to operate this device under the FCC certification.

The header on the AXON™ Module is a SAMTEC FTMH-110-02-L-DH, and mate connection is CLM-110-02-L-D.

2. The AXON™ Module may not be co-located with any other transmitter or antenna.

*3. The AXON™ Module is approved using the FCC "**Unlicensed modular transmitter approval**" method. Therefore the AXON™ Module must only be used with the originally approved antenna(s).*

As long as the 3 conditions above are met, further transmitter testing will not be required. However, the OEM integrator is still responsible for testing their end-product for any additional compliance requirements required with this module installed (for example, digital device emissions, PC peripheral requirements, etc.).

IMPORTANT NOTE: In the event that these conditions can not be met (for example certain, co-location with another transmitter, or different antenna), then the FCC authorization is no longer considered valid and the FCC ID can not be used on the final product. In these circumstances, the OEM integrator will be responsible for re-evaluating the end product (including the transmitter) and obtaining a separate FCC authorization.

OEM End Product Labeling

The final end product that has integrated the AXON™ Module must be labeled in a visible area with the following: **Contains TX FCC ID: SP8-IWTBB1142**

IMPORTANT NOTE TO OEM

The end user of the OEM's product, with incorporated AXON™ Module, should NOT be provided any instructions on how to remove or install the AXON™ Module.

The AXON™ Module Interface (Getting Started)

Voltage must be supplied to the AXON™ Module via pins 19 and 20 on the interface header. The AXON™ Module regulates its voltage on board, but must be supplied a voltage between 3.3-6 Volts. The table below outlines the 20 pin interface to the AXON™ Module. The mechanical diagram that follows indicates where pin-1 starts.

Connector Pin out	TP Name	Connector Pin out	TP Name
1	TDI/TDO	2	SPI_CS
3	TDI	4	IWT
5	TMS	6	UART_Data_uP
7	TCK	8	UART_Data_PC
9	GND	10	SPI_SIMO
11	RESET	12	SPI_SOMI
13	SPI_CLK	14	GPIO3
15	GPIO5	16	GPIO4
17	A0	18	IWT
19	GND	20	V_Batt

Once power is applied to pins 19 and 20, primary communication through the AXON™ Module will take place on pins 6 and 8. These pins are the buffered UART interface to the Module. This UART interface is 3.3-Volt logic only. To communicate with a PC and RS232 Translator must be used on the customer's end device. The AXON™ Programmer Board, used for prototype development, translates the UART signaling to PC levels. Innovative Wireless Technologies' document "AXON™-Synaptrix™ Network Interface Specification" outlines the communication protocol utilized on the UART plus the over the air communication protocols for your peer-to-peer and mesh network configurations.

Once the UART link has been correctly initialized, your device can then utilize the AXON™ Module to communicated information wirelessly to other AXON™ Modules. This allows the end user to quickly setup communication links between two or multiple devices. If communication becomes inoperable, momentarily pulling pin 11 (RESET) low, 0-Volts, will reset the AXON™ Module.

AXON™ Module Electrical Specifications

| Parameter	Min.	Typ.	Max.	Unit	Condition/Note
Overall					
Operation Temperature	-40		85	ºC	Ambient Temperature
RF Frequency Range	2400		2483.5	MHz	Programmable in 1 MHz steps. 5 MHz steps needed for compliance with 802.15.4
Absolute Supply Voltage	3.3		+6	V	
Transmitter					
Transmit Bit Rate	250		250	kbps	802.15.4/D18
Transmit Chip Rate	2000		2000	kChips/s	802.15.4/D18
Nominal Output Power		0		dBm	Delivered into 50Ω load
Receiver					
Receiver Sensitivity	-90	-94		dBm	PER=1%, Measured through 50Ω load, conducted.
Dynamic Range	90			dB	PER=1%, Measured through 50Ω load, conducted.
Frequency Error Tolerance	-300		300	kHz	
General I/O Available					
GPIO3-5					
SCHMITT-Trigger Input Specifications					
V_{IT+} Positive-going input threshold	1.5		1.9	V	
V_{IT-} Negative-going input threshold	0.9		1.3	V	
V_{hys} Input voltage hysteresis	0.5		1.0	V	
Output Specifications					
VOH High-level output voltage					
Test Condition IOH(max) = -1mA	Vcc-0.25		Vcc	V	
Test Condition IOH(max) = -6 mA	Vcc-0.60		Vcc	V	
VOL Low-level output voltage					
Test Condition IOL(max) = 1.5 mA	Vss		Vss+0.25	V	
Test Condition IOL(max) = 6 mA	Vss		Vss+0.6	V	
Analog to Digital Inputs Available					
A0					
Accuracy		12		Bit	12 bit ADC
Input capacitance			140	pF	
Input resistance			2050	Ω	
External Voltage Reference (selectable via resistor divider)	1.4		3.3	V	
Current Consumptions					
Transmit Mode		19		mA	Measured at 4.5 V (3-AA supply)
Receive Mode		21		mA	Measured at 4.5 V
Idle Mode		470		uA	Measured at 4.5 V (OSC and UART running)
Sleep Mode		140		uA	Measured at 4.5 V (No OSC or UART)

Mechanical Board Dimensions
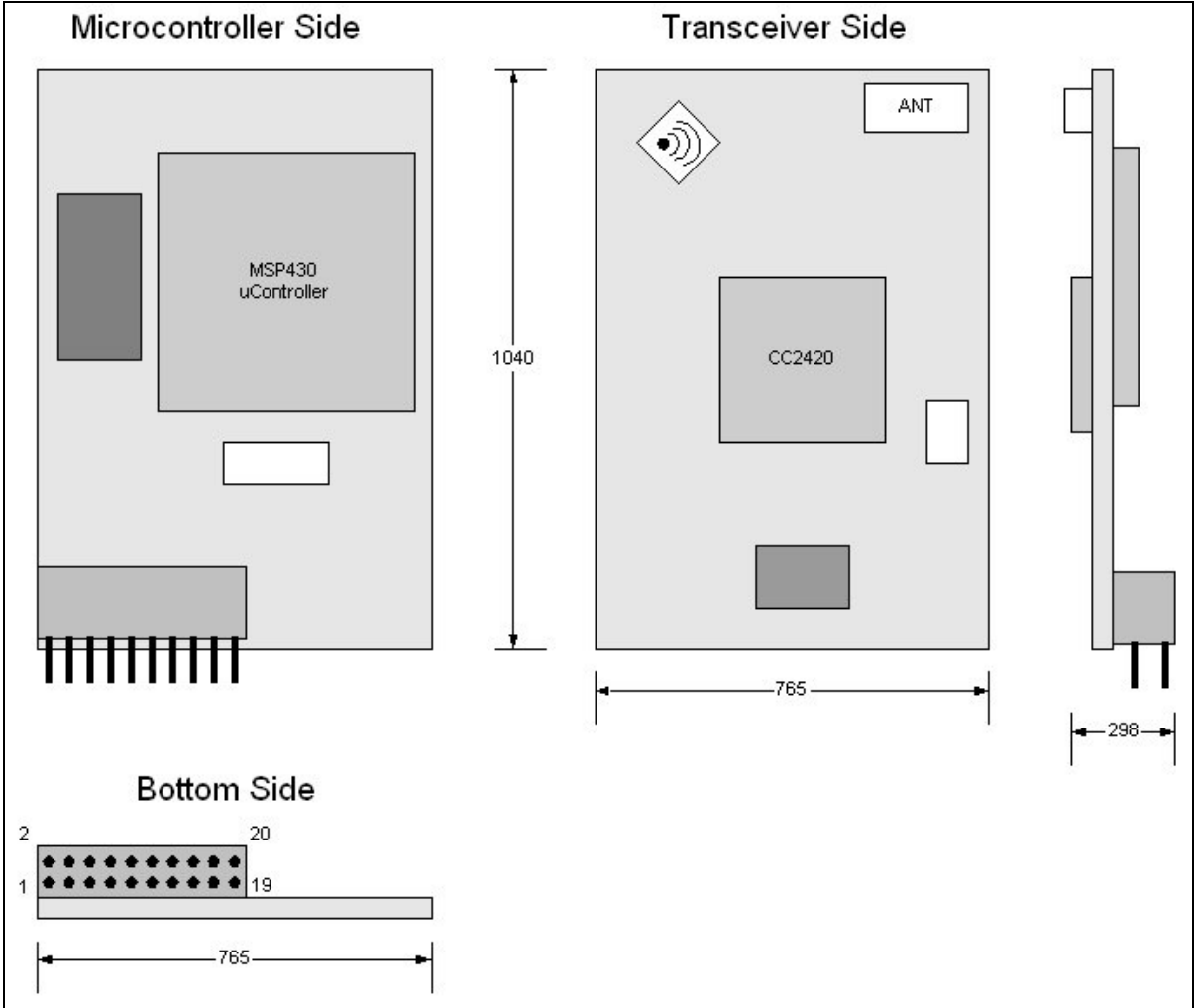
Figure 2 Module Dimensions (mils)

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