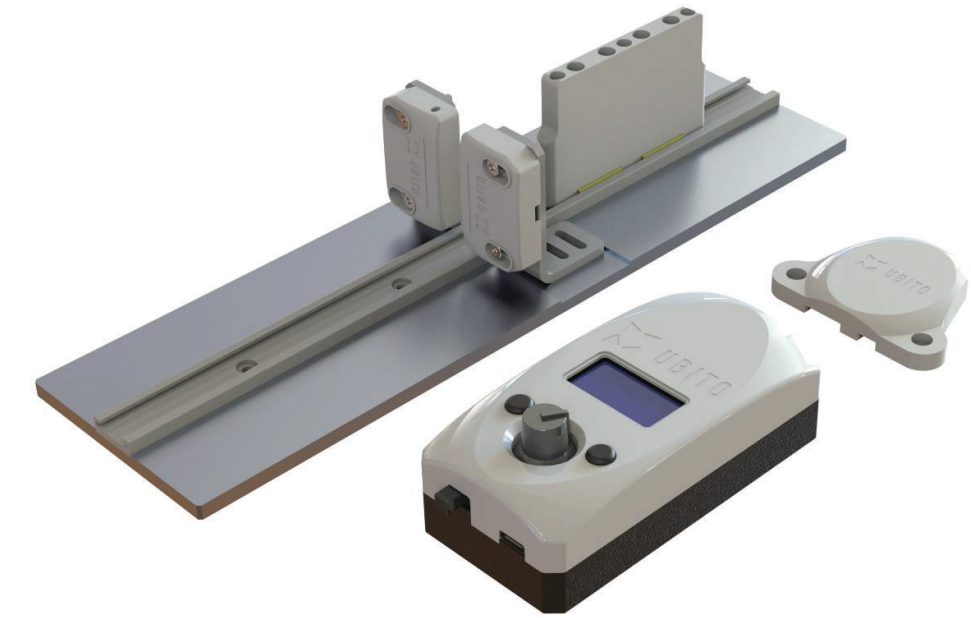
WIEGAND IOT NODE KIT

UBITO-WINK



Quick Start Guide

WIEGAND IOT NODE KIT

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General Information

The Wiegand IoT Node Kit (UBITO-WINK) is an engineering evaluation board/kit that is designed for use in engineering development, demonstration, or evaluation purposes only. It is not intended to be a finished end-product that is suitable for general consumer use, and it may not meet the same safety and environmental standards (FCC, CE or UL) as commercial products that incorporate the same components or circuit boards.

Individuals who handle the product must have electronics training and observe good engineering practice standards. The user assumes all responsibility and liability for the proper and safe handling of the goods, and the manufacturer, FRABA, is indemnified from all claims arising from the handling or use of the product.

As the product has some open elements, it is the responsibility of the user to take appropriate precautions with regard to electrostatic discharge. As the receiver unit of the Wiegand IoT Node Kit contains LiPo battery, it is important to observe general precautions for working with batteries. Furthermore, the parties involved are not liable to each other for any indirect, special, incidental, or consequential damages, except to the extent of the indemnity set forth above.

Safety Information

1. When working with an electronic circuit with open elements, make sure to keep it away from any liquids, and avoid touching any exposed wires or conductive materials.
2. UBITO-WINK contains SR1010 UWB Chip. It is a wireless communication device and should not be placed on top of, or in direct contact with any medical device.
3. When working with batteries, make sure to follow the manufacturer's instructions for safe use and storage, as well as any relevant laws and regulations related to their disposal.
4. Do not dispose device in fire
5. Proper electronics training required
6. Contains magnetic materials

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Introduction

The Wiegand IoT Node Kit is a wireless sensing device that is self-powered using Wiegand Energy Harvesting Technology. The device is designed to read data from external sensors and can transmit this data wirelessly up to 50 meters (The distance of data transmission can be impacted by factors such as the presence of physical barriers) using the Spark UWB interface.

UBITO-WINK contains the following components required for its functionality:

Number	Item	Quantity
1	Wiegand Harvester (10067395)	2
2	Node (10067386)	1
3	Base (10067389)	1
4	Sensor Panel Temperature (10067397)	1
5	Base Plate (10067508)	1
6	Guide Rail (10067554)	1
7	Magnet Holder (10067507)	1
8	L-Bracket (10067509)	2
9	Screw DIN 912 M3 x 10 A4 (10020119)	4
10	Screw DIN 912 M3 x 6 A4 (10067556)	4
11	Cable Assembly: Sensor Panel - Node (10067398)	1
12	Cable Assembly: Harvesters – Node (10067459)	1
13	Type C USB cable	1

*** Sensor panels (Position 4) included in the packaging may differ from version to version.**

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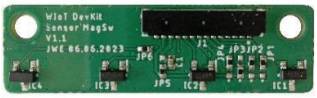
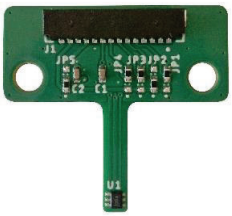
The UBITO-WINK Node has a built-in temperature sensor. However, it is also possible to connect external sensors, such as temperature or magnetic field sensors. Additionally, other customized, resistive sensors can be connected using the Breakout Board, which is equipped with pin connectors to simplify the connection of sensors.

Breakout Board

Magnetic Field Sensor

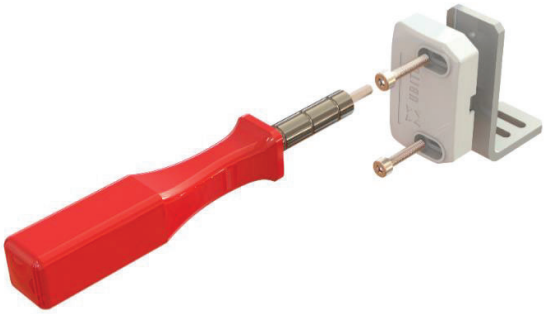


Temperature Sensor



Device Assembly

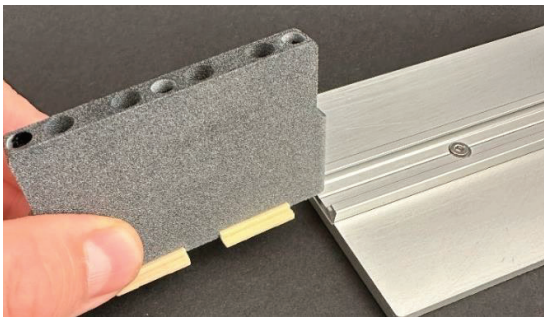
1. Mount Harvester (1) on the L-Bracket (8) using 2 Screws DIN 912 M3 x 10 A4 (10).



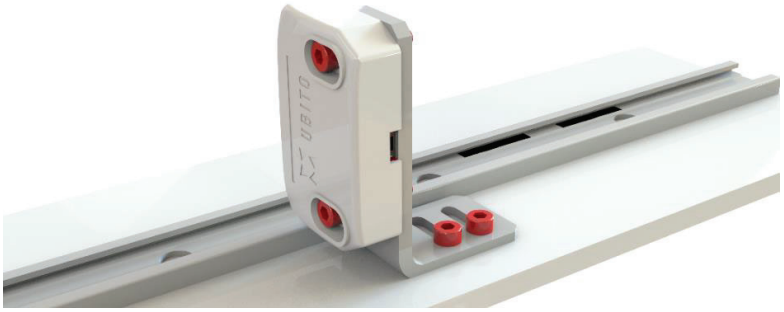
2. Mount L-Bracket (8) on the Base Plate (5) using Screw DIN 912 M3 x 6 A4 (10).

3. Repeat the operation for the second Harvester (1)

4. Slide Magnet Holder (7) into Guide Rail (6). Adjust screws on the bottom of Magnet Holder if needed, to ensure smooth sliding.

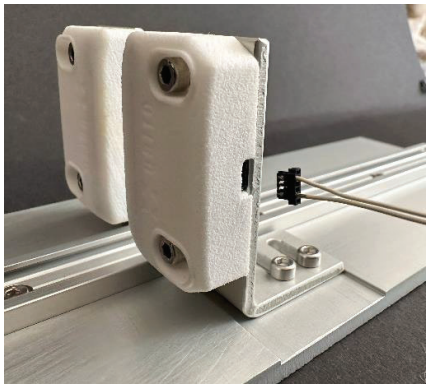


5. Using screws (9) and (10) align L-Bracket (8) and Wiegand Harvester (1) so that the main axes (shown by line above the logo) of the Wiegand Harvesters are parallel to each other and perpendicular to the surface of the Base Plate (5). The Wiegand Harvesters must be placed symmetrically in respect to the Magnet Holder (7) and the distance between the main axes must be 20 mm.

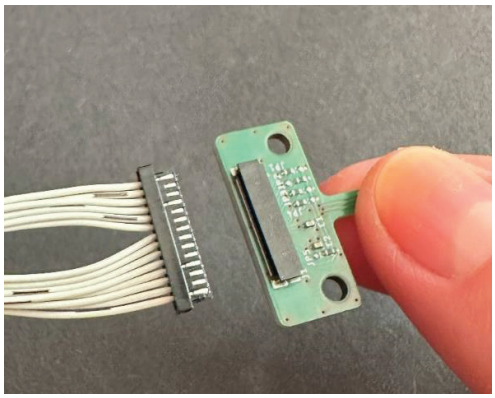


Main Axis of Wiegand Harvester.
Indicates position of Wiegand Wire

6. Connect both Harvesters (1) to the Node (2) using Cable Assembly: Harvesters – Node (12).




7. Connect Sensor Panel Temperature (4) to the Node (2) using Cable Assembly: Sensor Panel - Node (11).

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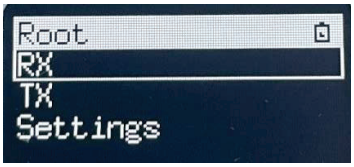
Operation

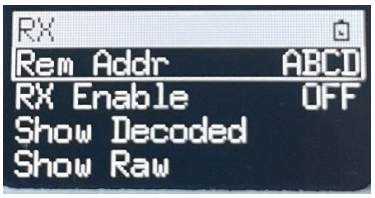
1. OLED Screen
2. Navigation Knob. Rotate – Navigate menu. Press – Select
3. Reset. Reset the device
4. Back. One step back in menu
5. Power Switch
6. USB Type C Port
7. Expansion GPIO connector

1. Switch on Base using Power Switch on the bottom of the device. The UBITO logo will appear for approximately 2 seconds. If this does not happen, then switch the Base off and charge it using Type C USB Cable (13) for about 1 hour. Switch on device.

2. After a few seconds, the following menu will appear.

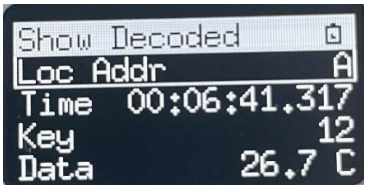


3. Choose RX submenu by pressing the Navigation Knob, you will see the following window.



4. Scroll down and choose RX Enable. Press the Navigation Knob. Rotate the Navigation Knob, set ON and press to confirm. Press the Back button.

5. Choose submenu Show Decoded. Now please move a Slider – Magnet Holder Along the rail with moderate speed (1 cm/s). The Slider must move from one end of Guide Rail to the other passing the Wiegand Harvesters without stopping. If the distance and position of Harvesters is set up correctly, the following message will appear



- Remote Address –Identifier of the transmitter (Node)
- Time – Timestamp of the message. Time when the message was received.
- Key – Key that relates to the data payload (12 = external temperature sensor)
  Data – Sensor Data

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Watch our UBITO-WINK Assembly and Operation Demo Video

https://youtu.be/JXHJhQecwxI?si=vgg_idO_KAlJXr4q

Antenna and Radio Transmission

For wireless communication UBITO-WINK utilizes UWB technology developed by Spark Microsystems International Inc. Both the Node and Base units are equipped with SR 1010 communication chips and monopole antennas. To ensure good signal quality please take into consideration the monopole antenna radiation pattern and any blind spots it may have.
More details about UWB radio transmission can be found on the SPARK microsystems official website.

1. SR10x0 Hardware Design Guide. https://www.sparkmicro.com/wp-content/uploads/2022/04/SR10x0_Hardware_Design_Guide_V1.1.pdf
2. SR 1010 Datasheet. https://www.sparkmicro.com/wp-content/uploads/2023/04/datasheet_SR1010-4.pdf

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Connection to a PC

The UBITO-WINK Base has several output interfaces. By default, a USB interface is enabled. It allows the user to connect Base to a PC using a USB Type C cable and output, store and process the data received from the node(s). In order to transfer the data to a PC, a COM port emulator is recommended (e.g. Termite – a freeware option)
https://www.compuphase.com/software_termite.htm

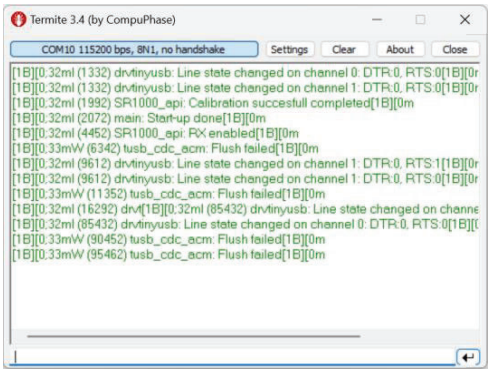
UBITO WINK Base to PC data transfer process:

1. Connect Base to a PC via USB Type C

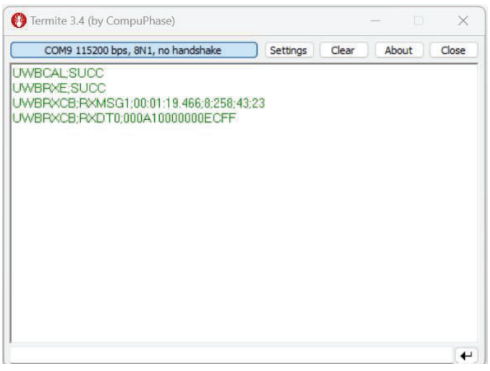
2. Switch on Base, enable RX communication, and choose menu “Show decoded” (as described in previous chapter.)

3. Install and open Termite on your PC. Select an available COM port and set the baud rate to 115200. (Base uses two separate COM ports - One for service messages/diagnostics and one for sensor data transmission. See screenshot below)

3. Move Slider (Magnet Holder) and check that data is visible on Base screen and with COM port emulator.



Service message



Sensor data received from the Node

Upon Power-on and following RX Enable, the following data will be transmitted from the Base to the PC:

UWBCAL;SUCC – UWB calibration process of the base was successful.

UWBRXE;SUCC – UWB receiver (Base) was enabled successfully.

For each data package received from a Node, the following data will be transmitted from the Base to the PC:

UWBRXCB;RXMSG1;00:01:19.466;8;258;43;23 – Parameters of UWB transmission

UWBRXCB;RXDT0;000A10000000ECFF – Message and sensor data

Parameter data package format:

UWBRXCB;RXMSG1;00:01:19.466;8;258;43;23

1	2	3	4	5	6	7

1. Message key 1: UWB RX Callback, UWB RX event happened
2. Message key 2: RX Message received; the following data contains RX Message information in format number 1
3. Timestamp of received message, HH:MM:SS.MSS
4. Payload data size in bytes, 8 = 8bytes
5. RSSI (=Received Signal Strength Indicator) in 1/10dB, 258 = 25.8dB
6. NSSI (=Received Noise Strength Indicator) in 1/10dB, 43 = 4.3dB
7. Signal Strength lower limit in 1/10dB*, 23 = 2.3dB

* Signal strength limits correspond to set RX gain, usually it is best to use the auto gain setup as this will choose the optimum gain after a few received messages. Autogain setup could be chosen from menu Settings/UWB/RX gain auto ON

Message Sensor data package format:

UWBRXCB;RXDT0;000A10000000ECFF

1	2	3	4	5	6

1. Message key 1: UWB RX Callback, UWB RX event happened
2. Message key 2: RX Message data package 0*, the following data contains the first 8 byte of data payload
3. 16-bit Node ID: 0x000A for this Node
4. 8-bit Node data / sensor key: 0x10 = “Internal temperature sensor” (See the table below)
5. 32-bit Payload data window: As the Node data / sensor key states “Internal temperature sensor”, the data is the MCU internal temperature in 1/10°C, 0x000000EC = 23.6°C
6. 8-bit Node message terminator 0xFF

Node Data / Sensor Key	Sensor	Data Format	Example
0x10	Internal temperature sensor	1/10°C	0x000000EC: 23.6°C
0x11	4 pin GPIO mode, for use with Breakout PCB (Only jumper 1, rightmost, must be set)	Lowest 4 bits: b0: PA2, b1: PA3, b2: PA9, b3: PA10	0x00000005: PA2 high, PA3 low, PA9 high, PA10 low
0x12	TMP20 external temperature sensor PCB	1/10°C	0x000000EC: 23.6°C
0x13	*SHT25 environmental sensor PCB*	*Pending release*	
0x14	Magnetic Switch PCB IC1, IC2, IC3, IC4, high/low per magnetic switch (Hall effect)	Lowest 4 bits: b0: IC1, IC2, IC3, IC4	0x0000000D: IC1 no magnet (high), IC2 no magnet, IC3 magnet present (low), IC4 no magnet
0x15	*OPT300X optical sensor PCB*	*Pending release*	
0x1F	*Node connected to Base*	*Pending release*	

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Product Specifications

Wiegand Harvester

Energy, typ.	9 µJ	Measured across @2kOhm resistor
Peak-pulse Voltage	6 V	

*Values are typical and will vary depending on set-up.

Magnet

Material	Neodymium
Dimension	Rod Ø5x30mm
Direction of Magnetisation	Axial
Magnet Grade	N45

Kit

Distance between Magnets	30 mm
Distance between Magnet and Wiegand Harvester	20 mm
Traverse speed	>1cm/second
Operating temperature	25°C

*Recommended conditions, results may vary significantly outside these conditions.

Transmission

SPARK Microsystems SR1010 UWB wireless transceiver	https://www.sparkmicro.com/wp-content/uploads/2021/11/SPARK-SR1000_Product-Brief_v6.9.pdf

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