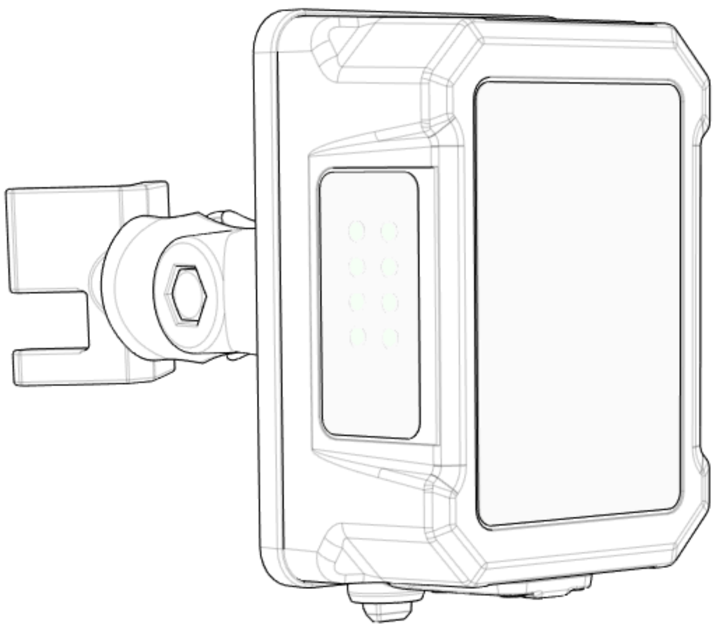
TECHNICAL MANUAL

SB1

10083 Sensor bridge



INTRODUCTION

The ReVibe SB1 (10083) is a Power-over-Ethernet (PoE) sensor bridge designed to use Modbus TCP to transmit measurement data which it receives wirelessly from connected sensors.
SB1 is designed to work with the ANURA VS family of sensors, utilizing the 2.4 GHz spectrum for communication. SB1 enables the Anura system to establish and manage connections with up to eight sensors per unit.

PACKAGE CONTENTS

Name:	Part no:
SB1 sensor bridge	10083
RAM Strap Hose Clamp	40006
RAM Double socket arm	40007
RAM Ball adapter with AMPS Plate	40008

INSTALLATION

1. Requirements

Please ensure that these requirements are fulfilled before starting the installation process:

- ☐ You have access to edit the automation controller’s configuration
- ☐ The automation controller has a Modbus TCP client (alternatively you can use a Modbus TCP gateway)
- ☐ There is an Ethernet switch supporting Power-over-Ethernet (PoE) to power the sensor bridge on-site

You have:

- ☐ A computer with which to configure the sensor bridge and the automation controller
- ☐ Tools for physically mounting components in desired locations
- ☐ A few regular Ethernet cables

2. Sensor preparations

If the sensors haven't already been installed, do so according to the instructions that came with the sensors.

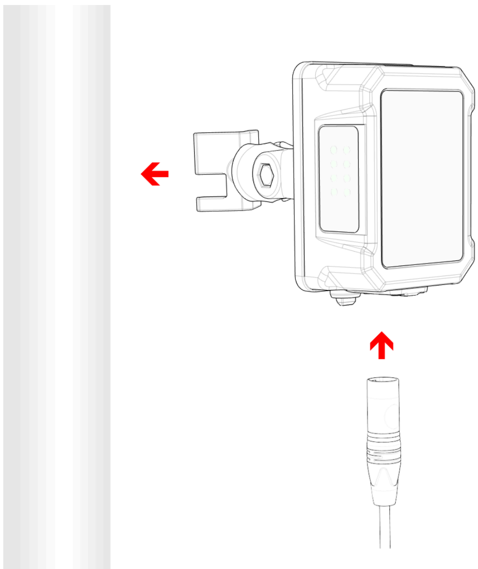
Write down the BLE address for each sensor. You find the BLE address written on the sensor's case under *ID:* in the format of *AA:BB:CC:DD:EE:FF*.

It may be useful to keep track of which sensor BLE address corresponds to which physical sensor (e.g. by having a name or number for each), in case you later wish to use the values from different sensors in different ways.

3. Physical installation

Mount the sensor bridge in its desired operation location.

Connect the sensor bridge to a PoE port on the Ethernet switch using the provided RJ45 to Neutrik etherCON cable. Eight orange LEDs on the transceiver indicate power and readiness on startup.



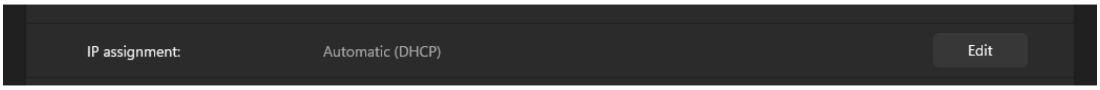
SB1 with RAM mount installed, fixate the RAM mount to a structure (e.g. pole or railing). Connect the Neutrik etherCON to the connector situated in the bottom of the sensor bridge. An audible click indicates that the connector is secure.

Connect the automation controller's Modbus TCP interface to the Ethernet switch using an Ethernet cable.

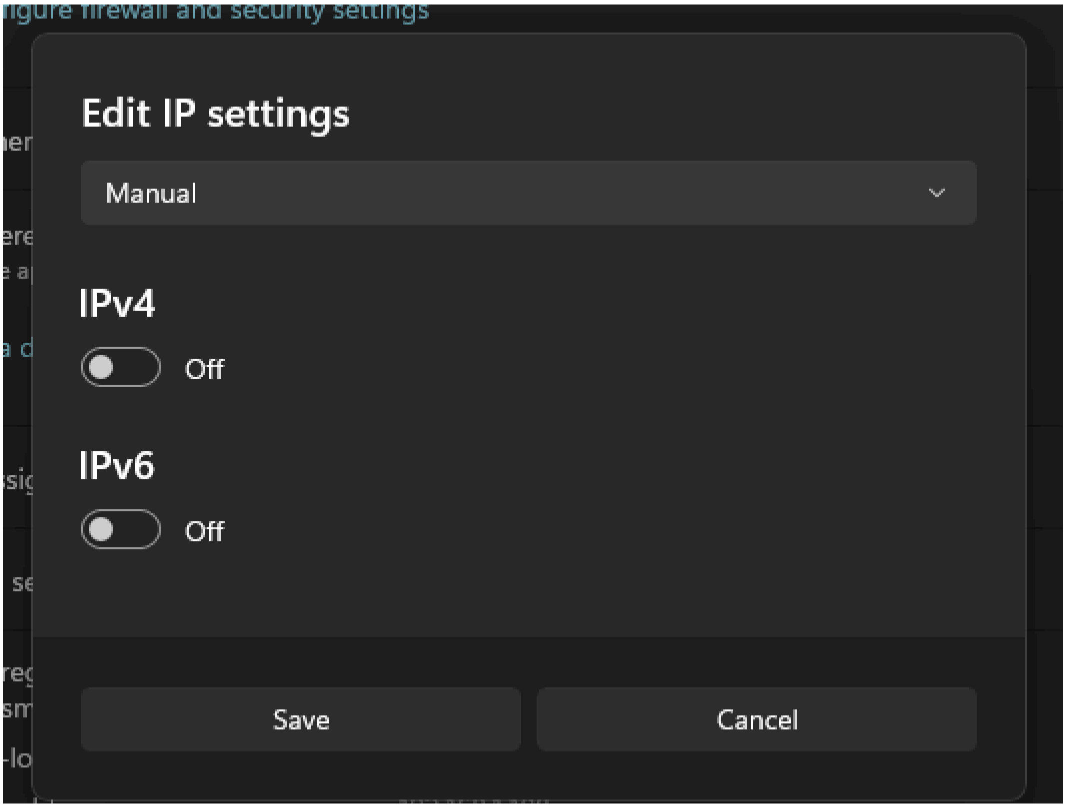
4. Setting your computer's IP address

Connect your computer to the Ethernet switch using an Ethernet cable.

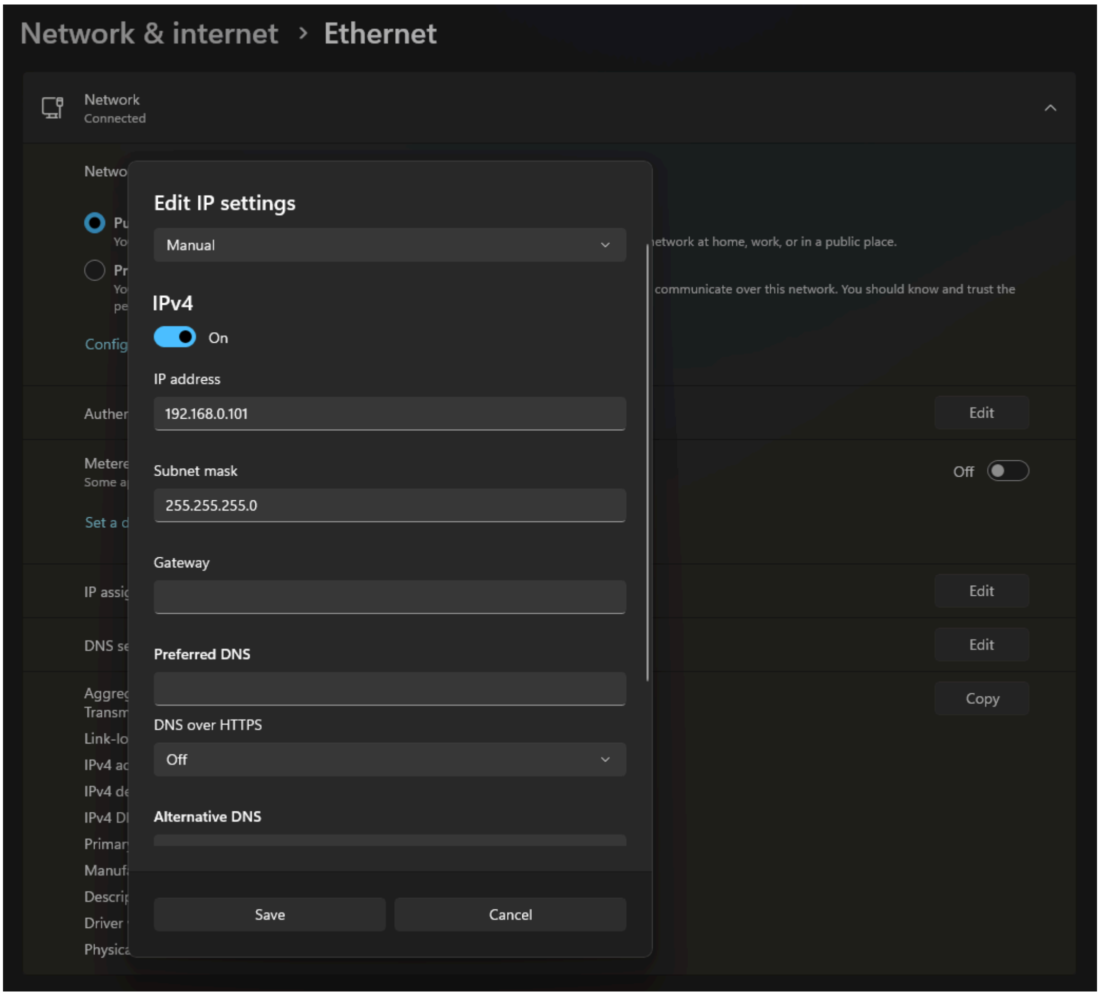
For Windows 11, open the *Settings* app and navigate to *Network & internet* and click on *Ethernet*. (For other operating systems guides exist online, search for "Setting static IP address in *my operating system*".)



On this page, there is a row for the device's IP assignment, click *Edit*.



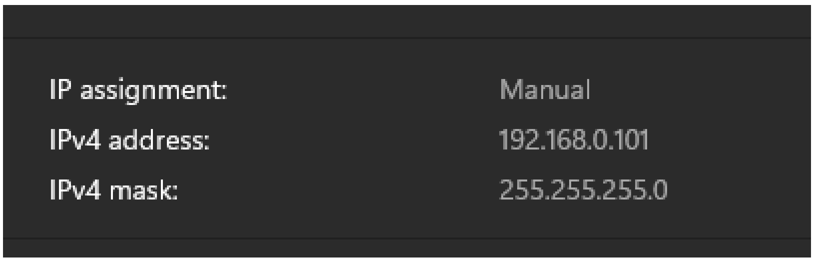
Select *Manual* in the dropdown. Then turn on the *IPv4* switch.



Fill in the fields you are presented with as follows:

- Set the IP address to 192.168.0.101, this will ensure that your computer is on the same network as the sensor bridge
- Set the subnet mask to 255.255.255.0
- The remaining fields can be left blank

Click *Save* to apply the settings.



The page should now tell you that your IP assignment is set to be manual, along with the configured IP address and subnet mask.

5. Setting the sensor bridge's IP address

Check that the sensor bridge is reachable on the network by pinging it at its default IP address, which is 192.168.0.100.

Table 1: SB1 Default network configuration

Default IP address	192.168.0.100
Default netmask	255.255.255.0
Default gateway	192.168.0.1

Decide what IP address the sensor bridge should have in your particular installation case.

Next up there are two methods for setting the sensor bridge's new IP address: Through a web browser, or over a Modbus connection.

Method 1: Set the IP address through a web browser

Open a web browser on your computer. Type 192.168.0.100 (the current IP address of the SB1) into the browser's address field and hit enter. If everything is working correctly, you should be greeted with the sensor bridge's setup page.

The section of the page labelled *Network Configuration* is what we will use here. Under *Update Settings*, write the new IP address into the field labelled *IP Address*.

You also need to fill in values for the netmask and the gateway address. If you want them changed, enter their new values into the relevant fields, otherwise enter the same value as is presented under *Current Settings*.

Hit the *Apply* button in order to apply and save the entered values on the sensor bridge.

Method 2: Set the IP address over Modbus

Download and install a Modbus client on your computer. E.g. the *Modbus Master Simulator* at http://www.en.radzio.dxp.pl/modbus-master-simulator/.

Set the server details as follows:

- IP address: 192.168.0.100
- Port: 502
- Unit/device-id: 1

Table 2: Map of registers used for device info including the network configuration

Address	Description	Type	Size (Registers)
40001-40016	Board name (ASCII)	STRING (32 bytes)	16
40017-40018	Hardware revision	UINT32	2

40019-40034	Device ID (ASCII)	STRING (32 bytes)	16
40035-40050	Application version (ASCII)	STRING (32 bytes)	16
40051-40066	Build version (ASCII)	STRING (32 bytes)	16
40067-40082	Serial number (ASCII)	STRING (32 bytes)	16
40083-40098	Hostname (ASCII)	STRING (32 bytes)	16
40099-40101	MAC address (48-bit)	UINT48	3
40102-40103	Static IP address (IPv4)	UINT32	2
40106-40107	Gateway (IPv4)	UINT32	2
40108-40109	Netmask (IPv4)	UINT32	2

Convert the new IP address for the sensor bridge to two UINT16 numbers (so that they can be written to the relevant registers) as follows: If the IP address is *a.b.c.d*, calculate the high UINT16 as $(a \cdot 256+b)$, and the low UINT16 as $(c \cdot 256+d)$.

To change the sensor bridge's Static IP address, write the high and low resulting numbers to the holding registers at address 40102 and 40103 respectively, as can be seen in table 2. (The Modbus function code for *Write Multiple Holding Registers* is 16.)

To also change the gateway address or netmask: First convert it to UINT16 numbers as described above. Then write the results to the registers for that particular setting, which can be found in table 2.

Table 3: Map of registers used for configuration activation & device control

Address	Description	Type	Size (Registers)
40600	Apply Configuration (1 = Apply, 2 = Save and Apply)	UINT16	1
40601	Reboot Command (1 = Reboot)	UINT16	1

To apply the new network configuration, write a 1 to the holding register at address 40600 (See table 3). (The Modbus function code for *Write Single Holding Register* is 6.)

Finishing up

Regardless of which method you used for setting the sensor bridge's new IP address some simple tests can be performed.

Ping the sensor bridge's default IP address of 192.168.0.100. It should not respond as it now has a different IP address configured.

To once again put your computer on the same network as the sensor bridge, edit your computer's static IP address as in installation step 4 of this document. This time set your IP address and subnet mask based on the network settings of your particular installation case.

Now your computer and the sensor bridge should be on the same network. To test, ping the sensor bridge's new IP address. This time it should respond.

If you set the sensor bridge's IP address over Modbus, there is one last step: To save the new network configuration in non-volatile RAM, write a 2 to the holding register at address 40600.

6. Registering the sensors with the sensor bridge

Access the automation controller's configuration.

A complete description of the Modbus protocol is outside the scope of this manual. Check your vendor's instructions for how to access Modbus communications from your particular automation controller.

Set up a Modbus client in the automation controller's configuration. Set the server details as follows:

- IP address: What you previously configured the sensor bridge with
- Port: 502
- Unit/device-id: 1

For each sensor that the sensor bridge should connect to, decide which of the sensor bridge's slots (from 1-8) that sensor should occupy.

Table 4: Map of registers used for the sensors' BLE addresses

Address	Description	Type	Size (Registers)
40500-40502	BLE Address - Sensor 1	UINT48	3
40503	Address Type - Sensor 1	UINT16	1
40504-40506	BLE Address - Sensor 2	UINT48	3
40507	Address Type - Sensor 2	UINT16	1
40508-40510	BLE Address - Sensor 3	UINT48	3
40511	Address Type - Sensor 3	UINT16	1
40512-40514	BLE Address - Sensor 4	UINT48	3
40515	Address Type - Sensor 4	UINT16	1
40516-40518	BLE Address - Sensor 5	UINT48	3
40519	Address Type - Sensor 5	UINT16	1

40520-40522	BLE Address - Sensor 6	UINT48	3
40523	Address Type - Sensor 6	UINT16	1
40524-40526	BLE Address - Sensor 7	UINT48	3
40527	Address Type - Sensor 7	UINT16	1
40528-40530	BLE Address - Sensor 8	UINT48	3
40531	Address Type - Sensor 8	UINT16	1

For each sensor, its BLE address will be assigned to a particular slot. In order to do this we first need to convert the BLE address into three UINT16 numbers, so they can be written to the relevant registers. Take care to note that the BLE address is written in hexadecimal. If the BLE address is *a:b:c:d:e:f*, calculate the first UINT16 as $(a \cdot 256+b)$, the second UINT16 as $(c \cdot 256+d)$, and the third UINT16 as $(e \cdot 256+f)$.

With the BLE address converted, write the resulting numbers to the three holding registers for the relevant slot which can be found in table 4 as *BLE Address – Sensor n*. (E.g. to register a sensor to slot 3, write the first, second, and third resulting numbers to the registers at address 40508, 40509 and 40510 respectively.)

Furthermore, we need to specify whether the address is public or private. Write a 0 (public) or a 1 (private) to the holding register specified in table 4 as *Address Type - Sensor n* for the relevant slot. (Normally the address will be public.)

Repeat this process for each of the sensors.

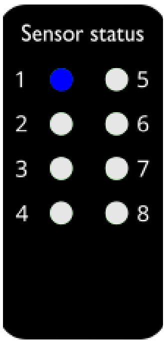
To both apply the sensor configuration and save it in non-volatile RAM so it persists across reboots (recommended), write a 2 to the holding register at address 40600 (See table 3). To only apply the sensor configuration (without saving it in non-volatile RAM), write a 1 to address 40600.

Even though it’s possible to save the sensor configuration in the sensor bridge itself, it is still recommended to keep up-to-date sensor configuration code in the automation controller. This is to ensure a consistent setup even if the sensor bridge needs replacing.

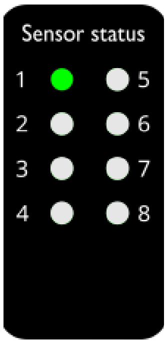
On the side of the sensor bridge there are eight LEDs indicating the status of each sensor slot. After having applied the sensor configuration, observing these LEDs may be helpful:

a. A blue LED indicates that a connection to a sensor is being initiated
b. A solid green LED indicates that a connection to a sensor has been established
c. A blinking green LED indicates that data is being transmitted from the connected sensor

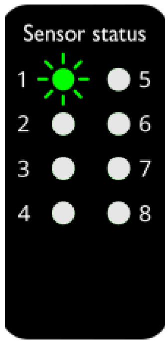
a.



b.



c.



When the code runs on the automation controller, the instructions to register the sensors to the specified slots will be written to the sensor bridge which will then initiate communication with the specified sensors.

The sensors' data will then be available from the sensor bridge at specific input registers; the addresses for these registers correspond to the slots to which the sensors were registered.

7. Accessing the sensor data

Access the automation controller’s configuration.

Table 5: Map of registers used for the sensor acceleration readings

Address	Description	Type	Size (Registers)
33000-33001	RMS acceleration in X axis [mm/s²] - Sensor 1	INT32	2
33002-33003	Maximum recorded acc. in X axis [mm/s²] - Sensor 1	INT32	2
33004-33005	RMS acceleration in Y axis [mm/s²] - Sensor 1	INT32	2
33006-33007	Maximum recorded acc. in Y axis [mm/s²] - Sensor 1	INT32	2
33008-33009	RMS acceleration in Z axis [mm/s²] - Sensor 1	INT32	2
33010-33011	Maximum recorded acc. in Z axis [mm/s²] - Sensor 1	INT32	2
33012-33013	RMS acceleration in X axis [mm/s²] - Sensor 2	INT32	2
33014-33015	Maximum recorded acc. in X axis [mm/s²] - Sensor 2	INT32	2
33016-33017	RMS acceleration in Y axis [mm/s²] - Sensor 2	INT32	2
33018-33019	Maximum recorded acc. in Y axis [mm/s²] - Sensor 2	INT32	2
33020-33021	RMS acceleration in Z axis [mm/s²] - Sensor 2	INT32	2
33022-33023	Maximum recorded acc. in Z axis [mm/s²] - Sensor 2	INT32	2
33024-33025	RMS acceleration in X axis [mm/s²] - Sensor 3	INT32	2
33026-33027	Maximum recorded acc. in X axis [mm/s²] - Sensor 3	INT32	2
33028-33029	RMS acceleration in Y axis [mm/s²] - Sensor 3	INT32	2
33030-33031	Maximum recorded acc. in Y axis [mm/s²] - Sensor 3	INT32	2
33032-33033	RMS acceleration in Z axis [mm/s²] - Sensor 3	INT32	2
33034-33035	Maximum recorded acc. in Z axis [mm/s²] - Sensor 3	INT32	2
33036-33037	RMS acceleration in X axis [mm/s²] - Sensor 4	INT32	2
33038-33039	Maximum recorded acc. in X axis [mm/s²] - Sensor 4	INT32	2
33040-33041	RMS acceleration in Y axis [mm/s²] - Sensor 4	INT32	2
33042-33043	Maximum recorded acc. in Y axis [mm/s²] - Sensor 4	INT32	2
33044-33045	RMS acceleration in Z axis [mm/s²] - Sensor 4	INT32	2
33046-33047	Maximum recorded acc. in Z axis [mm/s²] - Sensor 4	INT32	2
33048-33049	RMS acceleration in X axis [mm/s²] - Sensor 5	INT32	2
33050-33051	Maximum recorded acc. in X axis [mm/s²] - Sensor 5	INT32	2
33052-33053	RMS acceleration in Y axis [mm/s²] - Sensor 5	INT32	2
33054-33055	Maximum recorded acc. in Y axis [mm/s²] - Sensor 5	INT32	2
33056-33057	RMS acceleration in Z axis [mm/s²] - Sensor 5	INT32	2
33058-33059	Maximum recorded acc. in Z axis [mm/s²] - Sensor 5	INT32	2
33060-33061	RMS acceleration in X axis [mm/s²] - Sensor 6	INT32	2

Address	Description	Type	Size (Registers)
33062-33063	Maximum recorded acc. in X axis [mm/s²] - Sensor 6	INT32	2
33064-33065	RMS acceleration in Y axis [mm/s²] - Sensor 6	INT32	2
33066-33067	Maximum recorded acc. in Y axis [mm/s²] - Sensor 6	INT32	2
33068-33069	RMS acceleration in Z axis [mm/s²] - Sensor 6	INT32	2
33070-33071	Maximum recorded acc. in Z axis [mm/s²] - Sensor 6	INT32	2
33072-33073	RMS acceleration in X axis [mm/s²] - Sensor 7	INT32	2
33074-33075	Maximum recorded acc. in X axis [mm/s²] - Sensor 7	INT32	2
33076-33077	RMS acceleration in Y axis [mm/s²] - Sensor 7	INT32	2
33078-33079	Maximum recorded acc. in Y axis [mm/s²] - Sensor 7	INT32	2
33080-33081	RMS acceleration in Z axis [mm/s²] - Sensor 7	INT32	2
33082-33083	Maximum recorded acc. in Z axis [mm/s²] - Sensor 7	INT32	2
33084-33085	RMS acceleration in X axis [mm/s²] - Sensor 8	INT32	2
33086-33087	Maximum recorded acc. in X axis [mm/s²] - Sensor 8	INT32	2
33088-33089	RMS acceleration in Y axis [mm/s²] - Sensor 8	INT32	2
33090-33091	Maximum recorded acc. in Y axis [mm/s²] - Sensor 8	INT32	2
33092-33093	RMS acceleration in Z axis [mm/s²] - Sensor 8	INT32	2
33094-33095	Maximum recorded acc. in Z axis [mm/s²] - Sensor 8	INT32	2

The readings from each sensor slot will be available at input registers according to table 5. So if we e.g. want to access the Z-axis RMS acceleration for the sensor we registered to slot 2, we would read the two input registers starting at address 33020. (The Modbus function code for *Read Input Registers* is 4.)

If a sensor is not working, all of its values will be 0.

To avoid having to perform a large number of read operations for individual values, we can instead perform a single read operation for a whole block of addresses within the sensor acceleration readings address space. To do this, first understand which address range you wish to read by looking at table 5. The data can then be accessed by reading input registers at the address of the beginning of the range, and providing the length of the range as the amount of registers to read. For example if we wish to get all the acceleration readings for the sensors at slots 1, 2, and 3, we would read input registers at address 33000 with a length of 36 registers. One benefit of this approach is that you get a snapshot of the state of multiple sensors, instead of a slight delay between successive readings.

Once the desired data has been accessed, it can be stored in variables and then be used for, e.g., predictive maintenance or process optimization.

8. Accessing the sensor health data

Access the automation controller’s configuration.

Table 6: Map of registers used for the sensor health data. This block repeats for the eight sensors at addresses 31100, 31200, ..., 31800.

Address	Description	Type	Size (Registers)
31100-31101	Sensor uptime (seconds)	UINT32	2
31102	Reboot count	UINT16	1
31103	Reset cause	UINT16	1
31104	Temperature (x100 °C)	INT16	1
31105	Battery voltage (mV)	UINT16	1
31106	RSSI (dBm x100)	INT16	1
31107	Energy harvesting voltage (mV)	UINT16	1
31108-31109	Clock sync skew	FLOAT32	2
31110-31111	Clock sync age	INT32	2
31112-31113	Clock sync diff	INT32	2
31114	Health data age (seconds)	UINT16	1

The health data for each sensor will be available at input registers according to table 6. So if we e.g. want to access the *Battery voltage* of the sensor we registered to slot 4, we would read the input register at address 31405.

If a sensor is not working all of its values will be 0, except for the *Health data age* value which will be 0xFFFF.

As before, we can perform a single read operation for a block of addresses within the sensor health data address space (see table 6). However, note that in this case the block read in each single read operation needs to be contained to only one sensor’s health data, as there are unused registers between the health data for different sensors. I.e. all of the health data for one sensor can be read together, but health data for multiple sensors cannot be read together.

Once the desired health data has been accessed, it can be stored in variables and then be used for e.g. monitoring the sensors’ operational conditions.

9. Testing the installation

Observe the *Sensor status* LEDs on the side of the SB1 unit, they should be green for the sensor slots that are in use and blink when data is transmitted from each sensor.

Connect your computer to the Ethernet switch and use a Modbus client to read the sensors' acceleration readings. Check that they are live and non-zero.

Monitor the automation controller's operation and variables to see that it is behaving as expected.

TROUBLESHOOTING

For issues related to your automation controller, check with the relevant vendor.

Sensor bridge

- Make sure the sensor bridge is plugged into a powered PoE port on the Ethernet switch, otherwise it will not receive power.
- If you have trouble reaching the sensor bridge or have set an incorrect configuration for it, you can retrieve the IP address by pinging the sensor bridge by its hostname. If the sensor bridge's ID (found on the casing) is *AA:BB:CC:DD:EE:FF*, its hostname is *anura-aabbccddeeff.local* (in lowercase, without the colons from the ID).
- Double check with the register map tables that you are reading and writing the correct registers for each operation.

Network

- If you can't reach other devices through the Ethernet switch, check to see that the switch's configuration is as you expect.
- Make sure you don't set the same IP address for multiple devices on the network.
- Make sure all of the relevant devices have IP addresses and subnet masks configured so that they are on the same network.

Sensors

- Make sure the sensors are within range for the sensor bridge to reach them. Check the *Sensor status* LEDs on the side of the SB1 unit, and that the LEDs for the used sensor slots are green.
- Make sure you haven't gotten two sensors mixed up: Check which physical sensor has which BLE address, and which BLE address has been registered to which slot.
- If a sensor is behaving in an unexpected way, you can see if the health data for that sensor indicates any issues.

FIRMWARE UPDATES

The SB1 supports upgrades using the Ethernet connection, firmware updates can be performed through the setup page reached by entering the sensor bridge’s IP address into a web browser address field.

PRODUCT CARE

To ensure the longevity and optimal performance of SB1, please follow these care instructions:

General use:

Do not drop, throw, or subject the product to excessive force, as this could damage the plastic casing, aluminum plate, or internal components.

Cleaning:

Use a soft, damp cloth to gently clean the plastic casing and aluminum bottom plate. Avoid abrasive materials or harsh cleaning agents, as they may scratch the surfaces or damage the finish.

SUPPORT, WARRANTY & RMA ASSISTANCE

For help with product support, warranty claims, or initiating an RMA (Return Merchandise Authorization), our website provides all the resources needed.

https://revibeenergy.com/

RECYCLING

Disposal of Electrical and Electronic Equipment
This product is marked with the crossed-out wheelie bin symbol to indicate that it must not be disposed of as general household waste. Instead, it should be taken to an appropriate collection point for recycling electrical and electronic equipment. Proper disposal helps prevent potential harm to the environment and human health and promotes the sustainable reuse of materials. For more detailed information on disposal and recycling, please contact your local authorities or the retailer where the product was purchased.

SB1 TECHNICAL SPECIFICATIONS

Power supply:

PoE, supporting IEEE 802af.

Typical Power consumption:

1.2 W

Enclosure material:

Bottom plate: Hard anodized (type III) aluminum alloy.
Casing: PA6, Black.

Ingress protection:

IP65

Typical weight:

560g.

Dimensions: (excluding mounting accessories.)

140x98x60 (height x width x depth)

Operating Temperature:

-40°C to +80°C

Storage Temperature:

-40°C to +80°C (-40°F to +140°F)

Relative humidity:

0 to 95%, non-condensing

Mounting interface:

3x Pot magnets / Universal AMPS 4 hole pattern, 30x38mm.

Input connections:

PoE, IEEE 802 af.
10/100 Ethernet on RJ45, Neutrik etherCON CAT6a required for IP65.
Network Connections 10/100/BASE-T Ethernet on CAT6a: up to 100m

Wireless Communication:

2.4GHz

Connections:

Up to 8

Tx Power:

Typ. 0 dBm

Rx Sensitivity:

-98 dBm

Data Rates:

1 Mbps

Max data throughput:

4 sensors
Sample rate (Hz): 1024
Sample length (seconds): 5
Number of samples: 5120

Snippet interval (seconds): 60

Frequency:

2.400 to 2.483 GHz

Antenna Gain:

Typ. 6dBi

Time synchronization offset:

Typ. <5 µs

Expected product lifetime:

>5 years

ACCESSORIES

Cables:

Ethernet RJ45-NEUTRIK EtherCON CAT6a 10m
Ethernet RJ45-NEUTRIK EtherCON CAT6a 30m
Ethernet RJ45-NEUTRIK EtherCON CAT6a 60m

Mounting:

Sensor bridge side

4 hole 2" x 1,7" square base (included)

Extension arm

3” arm (included)

Rail side

Hose Clamp Base (1-2.1”) (included)
Tough-Claw™ Large Clamp Base (1-2.2”) (additional)

CONTACT

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