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Enable your ELA Beacon or Sensor

To enable your ELA sensors or ELA Beacons use the ELA application (Link:https://play.google.com/store/apps/details?id=com.ela.mobileapp.elamobileapp&hl=en_US). Your phone or device that is used for configuring ELA Sensors or Beacons has to have NFC (configurations are written to a sensor or beacon through NFC).

Below you can find on how to Enable and configure ELA Coin ID or ELA Puck ID to send in the iBeacon format.

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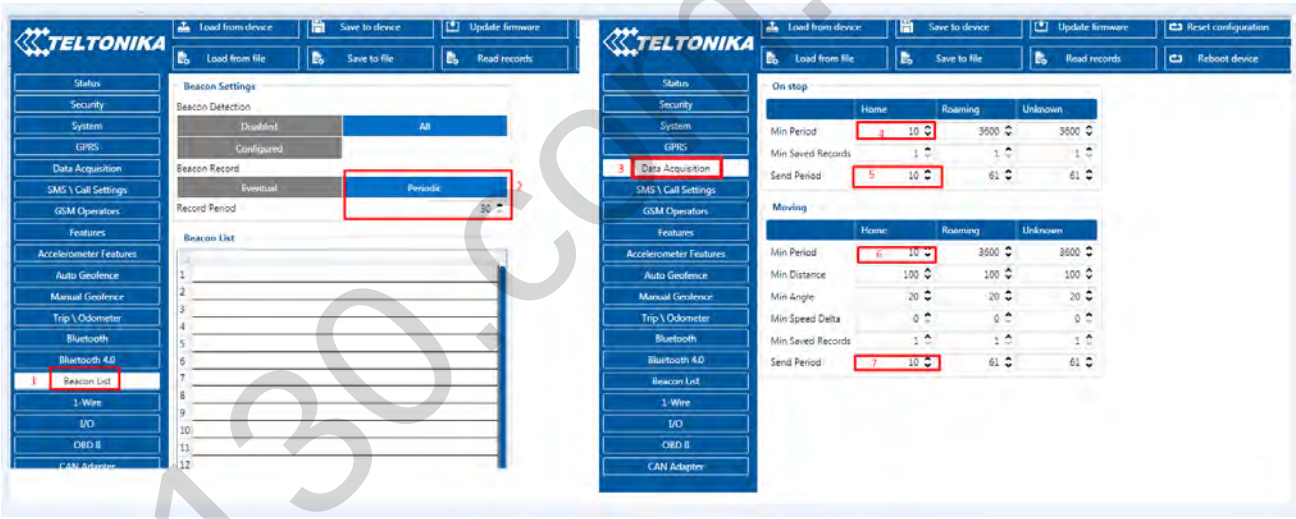
Beacon testing instructions

Instructions made with firmware version: FMB.Ver.03.25.09.Rev.51

1. Update FMB device firmware to version: FMB.Ver.03.25.09.Rev.51 (or later firmware version which supports beacon functionality)
2. Turn beacons ON (or configure it to send beacon ID)
3. Configure FMB device to send data into your server or computer over Codec 8 extended data sending protocol. Added print screens shows only one of possible ways how to perform test.

   Important: To perform test faster, configure Beacon record to → Periodic



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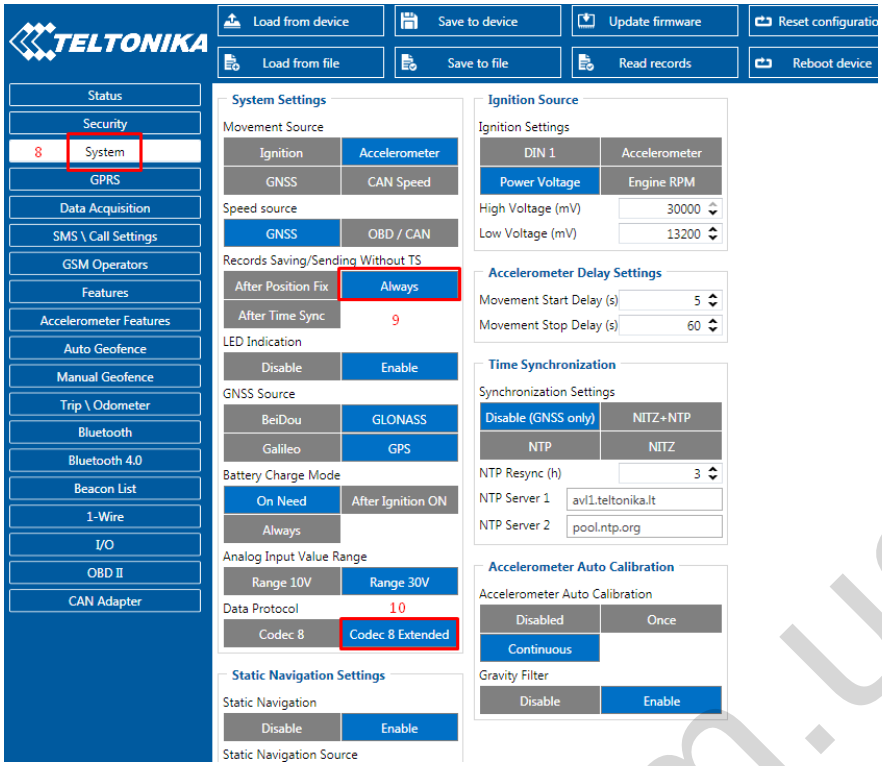
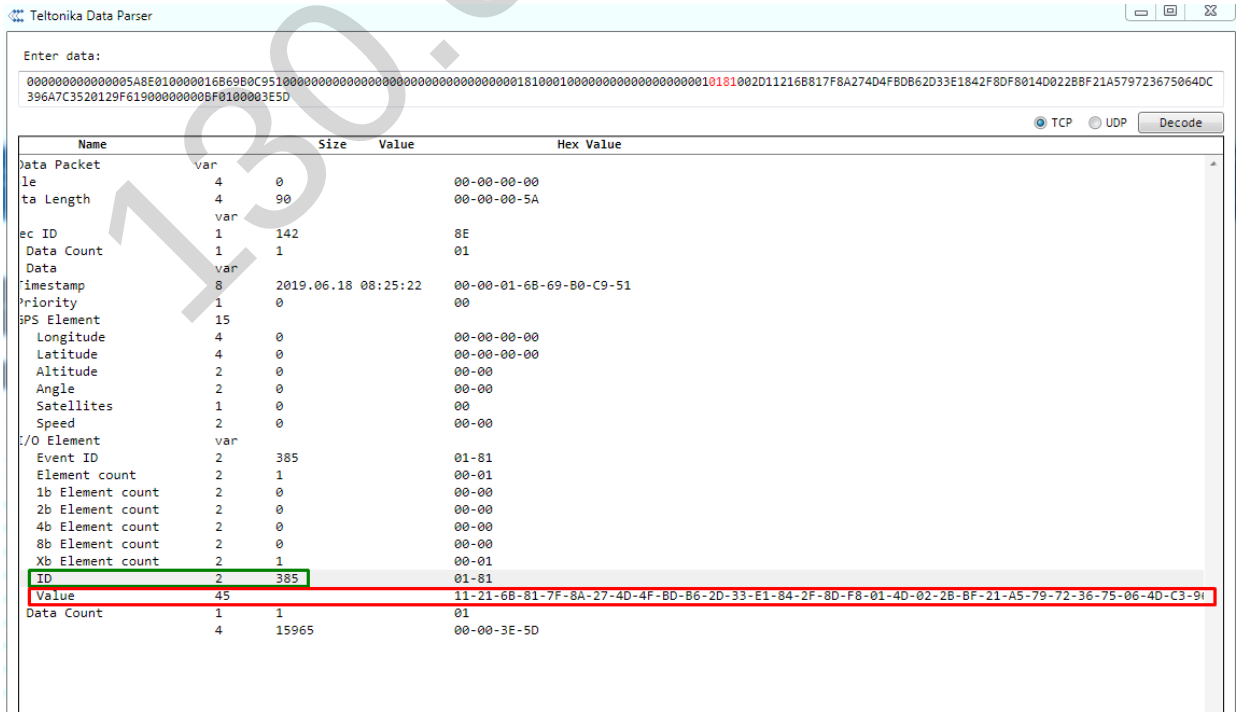


4. Open Teltonika listener tool or other tool which allows to receive AVL data from FMB device. Records will be received over codec 8 extended data sending protocol

5. After record received copy it into Teltonika Data parser. Beacon ID: 385



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Record parsing

Beacon records are sent as seperate Records with Event I/O ID 385 and also include I/O element 385 (Codec8 Extended has to be used, because the I/O element 385 uses Variable size IO element).

Example Beacon Record Packet:

000000000000005A8E010000016B69B0C9510000000000000000000000000000000001810001
00000000000000000001018100 2D11216B817F8A274D4FBDB62D33E1842F8DF8014D022BBF21A579
723675064DC396A7C3520129F61900000000BF0100003E5D

8E – Codec8 Extended Protocol

0000016B69B0C9510000000000000000000000000000000 – GPS data

0181 – Event I/O ID : 385 (Generated by Beacon Functionality)

0181 – Element I/O ID : 385 (Beacon Information stored here)

002D – Length of Beacon I/O element that was sent: 45 bytes

11216B817F8A274D4FBDB62D33E1842F8DF8014D022BBF21A579723675064DC396A7C3520129F61900
000000BF – Beacon Information that has been sent by device.

11 – Data part, 1 Record out of 1 Beacon Record. First half byte specifies, current record, second half specifies how many there are in total. For example: 25 – Second record out of 5 records (that means server can expect 3 more records with Event I/O ID 385).

1st Beacon data:

21 – BLE Beacon Flags, this value has to be converted to Binary. 00100001 – Bit 0 is 1, which means Signal Strength is available. Bit 5 is 1, which means iBeacon data has been sent. (0 – Eddystone; 1 - iBeacon).

6B817F8A274D4FBDB62D33E1842F8DF8014D022BBF – iBeacon Data:

17F8A274D4FBDB62D33E1842F8DF8 – UUID

014D – Major

022B – Minor

BF – Signal Strength :Signed 2's complement: -65 RSSI

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2nd Beacon Data:

21 – BLE Beacon Flags, this value has to be converted to Binary. 00100001 – Bit 0 is 1, which means Signal Strength is available. Bit 5 is 1, which means iBeacon data has been sent. (0 – Eddystone; 1 - iBeacon).

A579723675064DC396A7C3520129F619 – UUID

0000 – Major

0000 – Minor

BF – Signal Strength :Signed 2's complement: -65 RSSI

By parsing the BLE Beacon Flag (**It is known how many Bytes of data will follow After, For example if it is iBeacon (21), 21 Bytes of information will follow (UUID:16 Bytes+Major:2 Bytes+Minor:2 Bytes+RSSI:1 Bytes) if it is Eddystone(01), 17 Bytes of information will follow (Namespace: 10 Bytes+Instance: 6 Bytes+RSSI: 1 Bytes)**)

6. Information for data parsing:

Table 1. Beacon configuration parameters

Name	ID	Min	Max	Default	Description
Beacon Detection	134	0	2	0	0 (Disabled) – Functionality disabled. 1 (All) – All beacons are sent to server. 2 (Configured) – Only beacons from the list are sent to server
Beacon Record	136	0	1	0	0 (Eventual) – Disabled. 1 (Periodic) – All beacons are sent to server.
Record Period	137	30	3600	60	Beacon record saving period
Beacon List	1600 – 1624	Empty	42 B	Empty	List of authorized beacons. Eddystone and iBeacon protocols are supported*.

*Beacon Ids can be entered the following way: Namspace:CompanyID, UUID:Major:Minor. Any of the ID parts can be omitted ex., Namespace:. UUID::, UUID::Minotr, etc.

- Authorized Driving parameter (ID 11703) was extended to include new possible values: 2 – Beacon, 3 – Both (OneWire and Beacon).
- When Authorized Driving is configured to work with beacons, bluetooth scan procedure will be sarted for 5 minutes once ignition is detected.

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Beacon are sent to server in a new variable length Beacon (AVL ID 385). Beacon (AVL ID:385) has the following structure

Table 2. Beacon Packet structure

Data part	BLE beacon flags #1	Beacon ID #1	Signal Strength #1	Battery Voltage #1	Temperature #1	Beacon data #2
1 Byte	1 Byte	20B/16B	1 Byte	2 bytes	2 bytes	...
First half byte – current data part Second half byte – total number of data parts	Bitwise parameter, specify BLE beacon type and parameters (signifies if specific data is present for certain beacon) Bit 0 – signal strength 0/1 Bit 1 – Battery Voltage 0/1 Bit 2 – Temperature 0/1 Bit 3 – Reserved Bit 4 – Reserved Bit 5 – BLE beacon type 0/1 Bit 6 – Reserved Bit 7 – Reserved (eddystone/ibeacon)	iBeacon – 20B (UUDI, major, minor) Eddystone – 16B (Namespace, Instance ID)				...

Important: Battery Voltage and Temperature are not supported in 03.25.09.Rev.51.

BLE sensors testing instructions

1. Enable BLE sensor via phone application.“Device Manager Mobile“. This application can be downloaded via this link: https://play.google.com/store/apps/details?id=com.ela.mobileapp.elamobileapp&hl=en_US. Need to use Firmware 03.25.09.rev.51 (or later firmware version which supports beacon functionality).
2. In this application can be configured ELA sensors:
   - Change ELA sensor Name (Optional)
   - Enable ELA sensor.
   - Set ELA sensor signal power level (-40 is lowest signal power level, 4 is highest signal power level)
   - Choose the format of ELA sensor. For example if it‘s movement sensor it should be set as MOV
   - Advertising interval (s) with this parameter can be set interval for blue-tooth (optional)
   - Log interval (s) define the data logger period in seconds (optional)
   - Logger enable can enable for log mode.
   - Threshold acc is acceleration threshold for the tag which is working in MOV format only.

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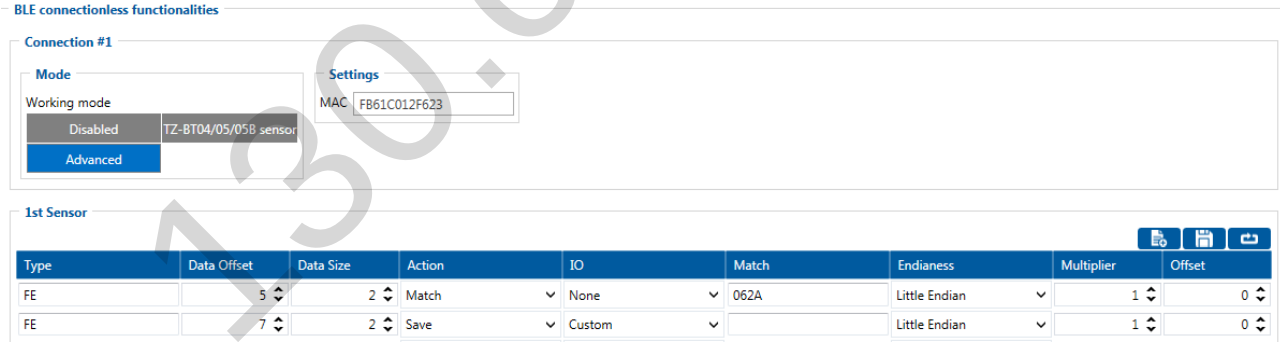
3. In configurator select BLE1 Sensor -> Advanced write usable sensor‘s MAC address. MAC ID can be found by using phone application nRF connect. Link to download: https://play.google.com/store/apps/details?id=no.nordicsemi.android.mcp&hl=en



4. Select Preset for the sensor which type it is. (**If the sensor you are using does not have a made Preset, follow instructions „How to configure a unique sensor if there is no preset"**)

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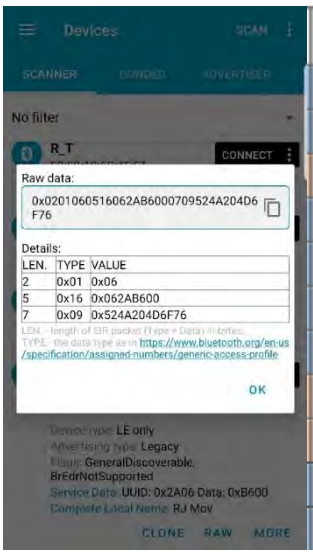
5. In the above shown configuration. I/O is set to „Custom“, that means data will be sent under the I/O element BLE Custom 1. However, if the I/O is set to Temperature/Humidity/Fuel etc. – data will be saved and sent under the corresponding I/O elements. Temperature – BLE Temperature #X; Battery – BLE Battery #X; Humidity – BLE Humidity #X etc.

BLE Temperature #1	°C	None	Low	High	Panic	0	0	Crash	Yes	No	Monitoring				BLE Temp #1
BLE Temperature #2	°C	None	Low	High	Panic	0	0	Crash	Yes	No	Monitoring				BLE Temp #2
BLE Temperature #3	°C	None	Low	High	Panic	0	0	Crash	Yes	No	Monitoring				BLE Temp #3
BLE Temperature #4	°C	None	Low	High	Panic	0	0	Crash	Yes	No	Monitoring				BLE Temp #4
BLE Battery #1	%	None	Low	High	Panic	0	0	Crash	Yes	No	Monitoring				BLE Battery #1
BLE Battery #2	%	None	Low	High	Panic	0	0	Crash	Yes	No	Monitoring				BLE Battery #2
BLE Battery #3	%	None	Low	High	Panic	0	0	Crash	Yes	No	Monitoring				BLE Battery #3
BLE Battery #4	%	None	Low	High	Panic	0	0	Crash	Yes	No	Monitoring				BLE Battery #4
BLE Humidity #1	%RH	None	Low	High	Panic	0	0	Crash	Yes	No	Monitoring				BLE Humidity #1
BLE Humidity #2	%RH	None	Low	High	Panic	0	0	Crash	Yes	No	Monitoring				BLE Humidity #2
BLE Humidity #3	%RH	None	Low	High	Panic	0	0	Crash	Yes	No	Monitoring				BLE Humidity #3
BLE Humidity #4	%RH	None	Low	High	Panic	0	0	Crash	Yes	No	Monitoring				BLE Humidity #4
BLE Custom 1		None	Low	High	Panic	0	0	Crash	Yes	No	Monitoring				BLE Custom sensor #1
BLE Custom 2		None	Low	High	Panic	0	0	Crash	Yes	No	Monitoring				BLE Custom sensor #2
BLE Custom 3		None	Low	High	Panic	0	0	Crash	Yes	No	Monitoring				BLE Custom sensor #3
BLE Custom 4		None	Low	High	Panic	0	0	Crash	Yes	No	Monitoring				BLE Custom sensor #4

How to configure a unique sensor if there is no preset

This can be done by using the application nRF connect by finding a custom sensor and selecting RAW data. For example there is a screenshot with a RAW data from ELA movement sensor. As a type we are using type 16 to select all the needed data. Data offset is used to specify from which Byte data should be read or taken. We will use match on 062A (see screenshot of ELA movement packet structure). Data 062A is constant, that is why in the configuration we use „Match“ to confirm that this is the correct packet. To take data from the Packet, we enter type 16 and configure „Save“ and Offset is 2 bytes. We select I/O – Custom (Because Movement Sensor data is not measured in Kvants/°C/Voltage/%RH etc.)



ELA MOV
Length : 2
Type : 0x01
Data : 0x06
Length : 5
Type : 0x16
Alert Charac : 0x06
Alert Charac : 0x2A
MOV (cnt+state) data LSB
MOV (cnt+state) data MSB
Length : 16
Type : 0x09

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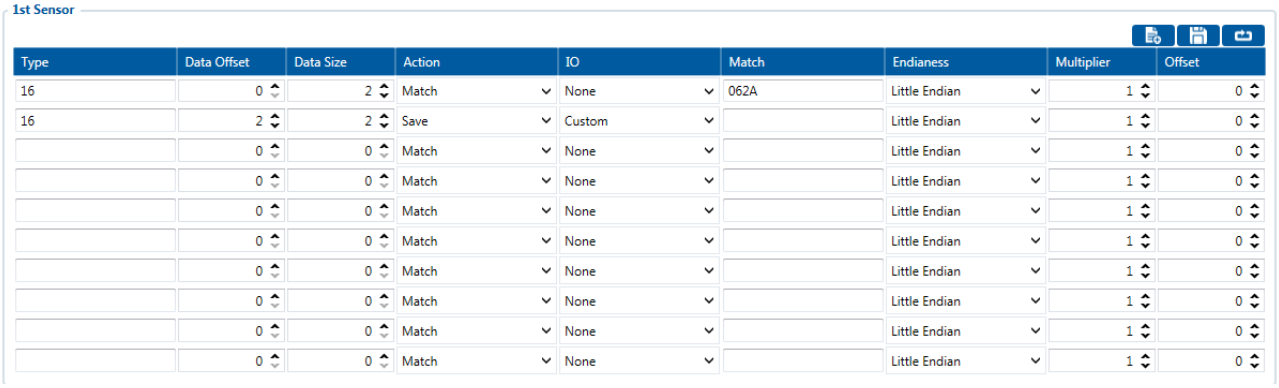
Example configuration of an ELA movement sensor


1st Sensor

Type	Data Offset	Data Size	Action	IO	Match	Endianess	Multiplier	Offset
16	0	2	Match	None	062A	Little Endian	1	0
16	2	2	Save	Custom		Little Endian	1	0
	0	0	Match	None		Little Endian	1	0
	0	0	Match	None		Little Endian	1	0
	0	0	Match	None		Little Endian	1	0
	0	0	Match	None		Little Endian	1	0
	0	0	Match	None		Little Endian	1	0
	0	0	Match	None		Little Endian	1	0
	0	0	Match	None		Little Endian	1	0
	0	0	Match	None		Little Endian	1	0

000000000000000378e01000000f9cf321e6801000000000000000000000000000000000000030000
0001001a097900000000000002014b0002001a014c00000100002a31

Example: IO ID[331] Length[2]: 00h 0Ah BLECustom#1

BLE sensor ID: 014B
Length of Element: 0002
BLE sensor value: 001A

Using the configuration shown above. 2 bytes of data are taken from the Broadcasted packet of the sensor. It is possible to configure for the device to save any data from the packet if the structure of the packet is known (**nRF Connect Application can be used for this**) and the protocol of the frames is known.

Table 3. Sensor Elements AVL ID's

Name	Connection #1 AVL ID	Connection #2 AVL ID	Connection #3 AVL ID	Connection #4 AVL ID
None	-	-	-	-
Temperature	25	26	27	28
Battery	29	20	22	23
Humidity	86	104	106	108
Custom	331	332	333	334
Fuel	270	273	276	279
Luminosity	335	336	337	338
Fuel Frequency	306	307	308	309

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AVL ID DETAILS

Property ID in AVL packet	Property Name	Bytes	Type	Min	Max	Multiplier	Units	Description
20	BLE 2 Battery Voltage	1	Unsigned	0	100	-	%	Battery voltage of sensor #2
22	BLE 3 Battery Voltage	1	Unsigned	0	100	-	%	Battery voltage of sensor #3
23	BLE 4 Battery Voltage	1	Unsigned	0	100	-	%	Battery voltage of sensor #4
25	BLE 1 Temperature	2	Signed	-400	1250	0.1	°C	Degrees (°C), -40 - +125; Error codes: 4000 - abnormal sensor state 3000 - sensor not found 2000 - failed sensor data parsing
26	BLE 2 Temperature	2	Signed	-400	1250	0.1	°C	Degrees (°C), -40 - +125; Error codes: 4000 - abnormal sensor state 3000 - sensor not found 2000 - failed sensor data parsing
27	BLE 3 Temperature	2	Signed	-400	1250	0.1	°C	Degrees (°C), -40 - +125; Error codes: 4000 - abnormal sensor state 3000 - sensor not found 2000 - failed sensor data parsing
28	BLE 4 Temperature	2	Signed	-400	1250	0.1	°C	Degrees (°C), -40 - +125; Error codes: 4000 - abnormal sensor state 3000 - sensor not found 2000 - failed sensor data parsing
29	BLE 1 Battery Voltage	1	Unsigned	0	100	-	%	Battery voltage of sensor #1
86	BLE 1 Humidity	2	Unsigned	0	1000	0.1	%RH	
104	BLE 2 Humidity	2	Unsigned	0	1000	0.1	%RH	
106	BLE 3 Humidity	2	Unsigned	0	1000	0.1	%RH	
108	BLE 4 Humidity	2	Unsigned	0	1000	0.1	%RH	
270	Eskort LLS Fuel Level #1	2	Unsigned	0	65535		-	Fuel Level
273	Eskort LLS Fuel Level #2	2	Unsigned	0	65535		-	Fuel Level
276	Eskort LLS Fuel Level #3	2	Unsigned	0	65535		-	Fuel Level
279	Eskort LLS Fuel Level #4	2	Unsigned	0	65535		-	Fuel Level

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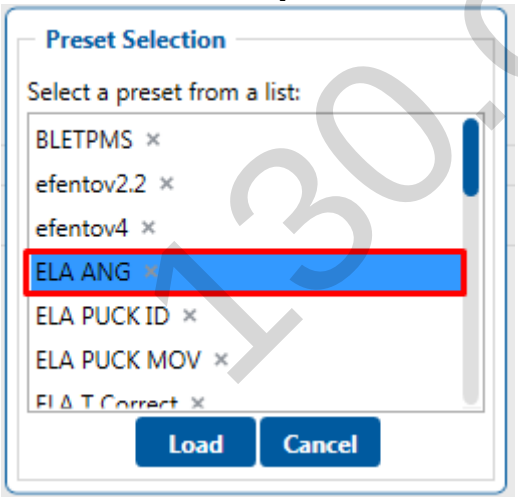
331	BLE Sensor 1	variable	HEX	0	256	-	-	Raw data of BLE sensor
332	BLE Sensor 2	variable	HEX	0	256	-	-	Raw data of BLE sensor
333	BLE Sensor 3	variable	HEX	0	256	-	-	Raw data of BLE sensor
334	BLE Sensor 4	variable	HEX	0	256	-	-	Raw data of BLE sensor
335	BLE Luminosity 1	2	Unsigned	0	0xffff	-	lx	Luminosity value of a BLE sensor
336	BLE Luminosity 2	2	Unsigned	0	0xffff	-	lx	Luminosity value of a BLE sensor
337	BLE Luminosity 3	2	Unsigned	0	0xffff	-	lx	Luminosity value of a BLE sensor
338	BLE Luminosity 4	2	Unsigned	0	0xffff	-	lx	Luminosity value of a BLE sensor

ELA Sensor additional information

ELA MOV

ELA MOV sensors can send data either in MOV mode or ANG mode. **ANG Mode**: acceleration (3 axis) on 16 bits / Axis(12 bits + a 16th sign bit); **MOV Mode**: 15-bit counter & instantaneous state* on 1 bit (LSB)

ANG Mode Data Example:



IO ID[331] Length[6]: 04 9C FF F8 00 03 BLE Custom 1

04 9C: 1180 – X axis

FF F8: -8 – Y axis

00 03: 3 – Z axis

Preset to use in the configurator: **ELA ANG**

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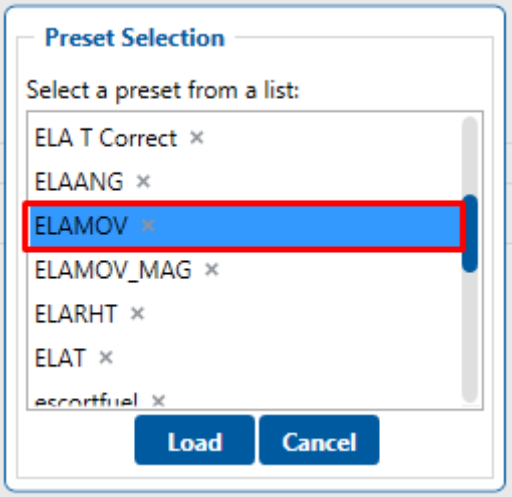
MOV Mode Data Example:



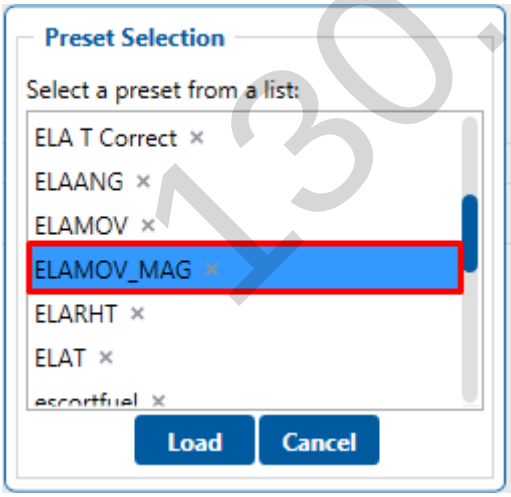
IO ID[331] Length[2]: 00 02 BLE Custom 1

00 02 - 0000 0000 0000 0010 (15 Bits Movement Counter: Movement Detected 1 time; 1 bit State of Sensor: Current State 0, not moving)

Preset to use in the configurator: **ELA MOV**

ELA MAG

ELA MAG sends data 15-bit counter & instantaneous state* on 1 bit (LSB).



MAG Mode data Example:

IO ID[331] Length[2]: 00 02 BLE Custom 1

00 02 - 0000 0000 0000 0010 (15 Bits Movement Counter: Attached/Detached Counter 1 time; 1 bit State of Sensor: Current State 0, Detached)

Preset to use in the configurator: **ELAMOV_MAG**

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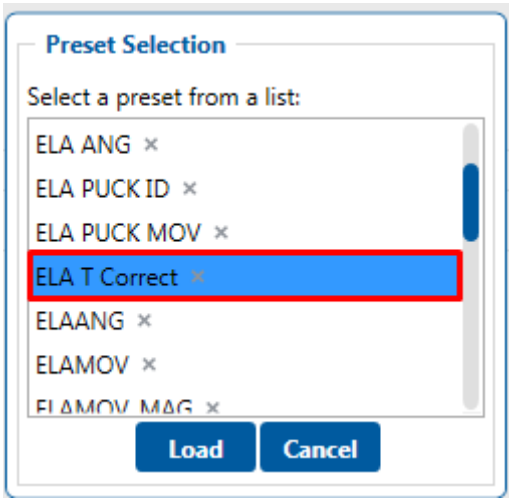
ELA T



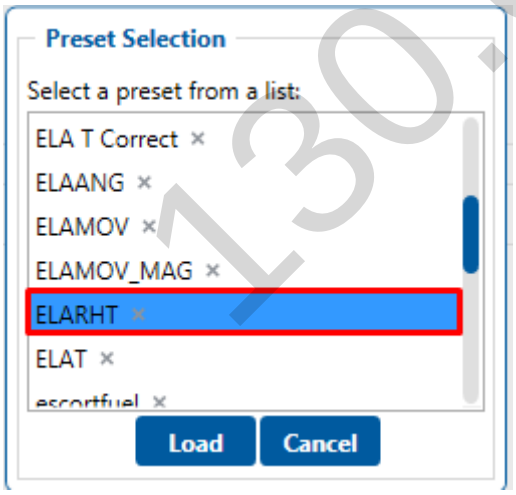
ELA T is a temperature sensor and it sends Temperature data.

T Mode Data Example:

IO ID[26]: 2550 °C BLE Temperature #2

Preset to use in the configurator: **ELA T**

ELA RHT



ELA RHT is a temperature and humidity sensor and it sends Temperature and Humidity data.

RHT Mode Data Example:

IO ID[27]: 2550 °C BLE Temperature #3

IO ID[106]: 54% BLE Humidity #3

Preset to use in the configurator: **ELA RHT**

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NOTICE:

If there are troubles with configuring a specific sensor for usage. Please contact your sales manager and send the RAW data packet from nRF Connect application and the protocol of the sensors broadcasted frames.

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