

Decoding BT510 Bluetooth Low Energy Temperature Advertisements

BT510

Application Note

v2.0

1 Introduction

The goal of this document is to demonstrate how to quickly decode BT510 Bluetooth Low Energy advertisements payloads that contain temperature data.

2 Overview

The BT510 is an even-driven IP67 Bluetooth Low Energy v5 multi-sensor. Capable of measuring temperature, motion and open/closed magnet detection, it comes preloaded with a default RTOS firmware developed by Ezurio which allows it to transmit data out of the box in two different ways:

- Advertisements
- Connection

When a sensor event such as temperature or motion is triggered, the BT510 starts a sequence of BLE adverts which contain information about the related event. The sequence of advertisements continues for the advertising duration and occurs at the advertising interval.

In addition to generate advertisements, events are stored in the BT510 internal flash. It makes it possible for users to connect in the field and download event logs if needed.

This guide will focus on the advertisements generated by the BT510 and more specifically to data triggered by the "Temperature" event. One of the most convenient ways to isolate and decode temperature data contained in the BT510 advertisements payload will be to use a tool like the Nordic nRF Connect mobile application.

3 Requirements

The following are required for this process:

- [Sentrius BT510 Bluetooth Low Energy sensor](#)
- Android or iOS device that supports Bluetooth LE
- [nRF Connect Mobile application](#)
- Sentrius BT510 Mobile application (available on the [Google Play Store / iTunes App Store](#))
- [Sentrius™ BT510 User Guide](#)
- PC

Note: As of January 2023, no more support will be provided in regards to the BT510 default FreeRTOS features and firmware, we highly encourage customers to develop their own BT510 software via Zephyr RTOS.

4 General Setup Preparation

If using a BT510 for the first time, you'll need to get your phone paired with the sensor before being able to configure it.

Once the pairing process is complete, you'll be able to configure temperature measurement. You'll need to enter a few other parameters such as temperature sensing period (Temps Sense), Advertisements Duration and Intervals.

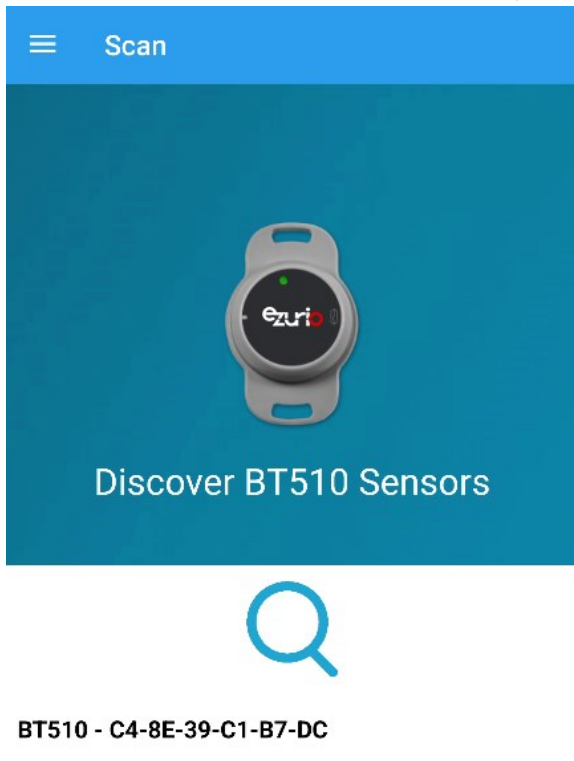
Note: We also suggest updating your BT510 sensor firmware to the last available version. Please follow the steps explained in the [Sentrius™ BT510 User Guide](#), section 5.5.

To prepare your setup, follow these steps:

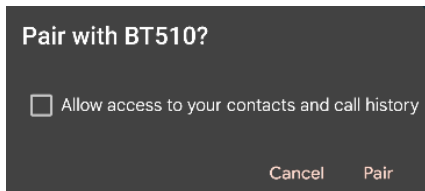
1. Follow the process shown in [Sentrius™ BT510 User Guide](#) section 3.1 by pressing the button in the center of the BT510 face at least three seconds until the green LED turns on. It will put the sensor into active mode.



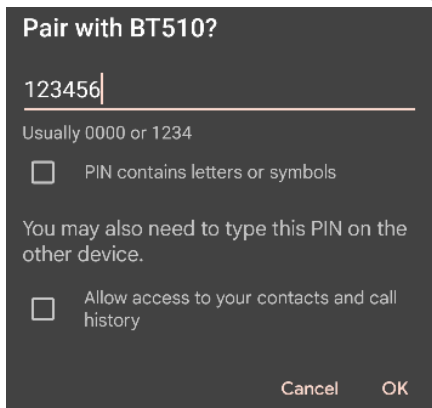
2. Take your phone, enable Bluetooth (plus GPS feature if using Android phone) and open the BT510 Mobile application. Tap **SEARCH**. You should see your BT510 appearing on screen.



- Tap your BT510's name. You should be asked to engage a pairing process with the sensor.



- Tap **Pair**. Then enter the default pairing key *123456* followed by "OK".



- Tap **Settings**.



- Configure the Intervals section (an example is provided below). Confirm settings by pressing **SET** for every row.

INTERVALS		
Temp Sense (s)	60	SET
Advertising Duration (ms)	15000	SET
Advertising Interval (ms)	1000	SET
Connection Timeout (s)	60	SET
Battery Sense (s)	0	SET

The configuration above will make the BT510 generate a "Temperature" event every 60 seconds. This event will be advertised every second for 15 seconds.

- Now you can disconnect by tapping the arrow at the upper left.

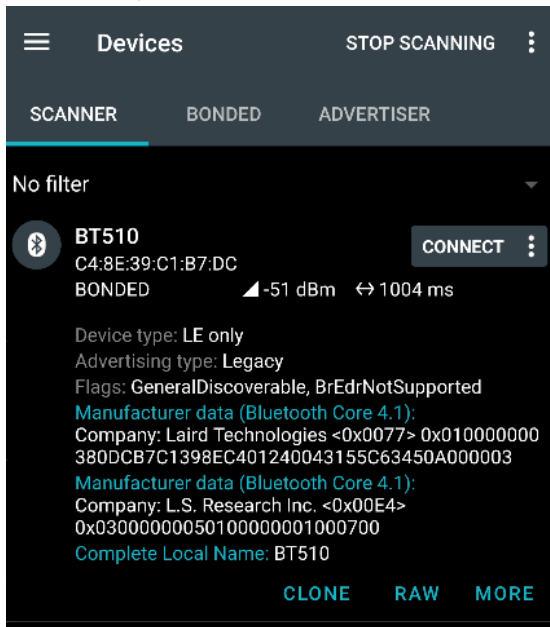


- Your BT510 is now ready to generate advertisements that contain temperature data.

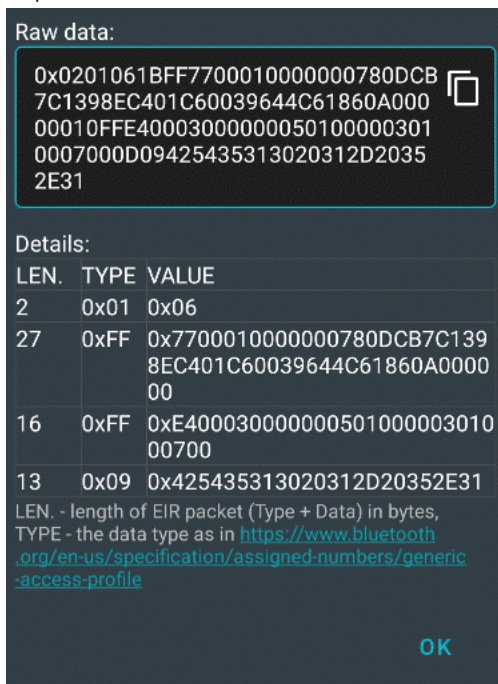
5 Temperature Data decoding

For locating temperature value in a BT510 advertisement payload, you'll need to refer on [Sentrius™ BT510 User Guide](#) section 4.1 **Advertisements** and more specifically to section 4.1.1 **1M PHY** and 4.1.2 **1M PHY Scan Response**.

- Open the nRF Connect Mobile application and start to Scan for BLE advertisements around. You should see your BT510 newly configured.



- Tap on **RAW** to see what a BT510 advertisement payload looks like from a raw data perspective.



This advert payload is composed of three different Data Types (0x01, 0xFF, 0x09) that all contain one or more bytes of value. For more information on different Bluetooth GAP Data Types, you can refer on [Generic Access Profile](#).

3. As per the [Sentrius™ BT510 User Guide](#) section 4.1, we can separate this advertisement into 2 distinct parts.

Details:			
LEN.	TYPE	VALUE	
2	0x01	0x06	
27	0xFF	0x77000100000000780DCB7C1398EC401C60039644C61860A000000	1M PHY Advert part
16	0xFF	0xE400030000000050100000301000700	1M PHY Scan response
13	0x09	0x425435313020312D20352E31	

Temperature value is located in the 1M PHY Advert part, within the Data Type 0xFF <Manufacturer Specific Data>.

4. The 1M PHY advertisement part follows the structure exposed into the User Guide, Section 4.1.1, Table 1, where byte 19 stands for the Record Type and bytes 26-29 stand for the data.

Table 1: 1M PHY

Byte	Description	Value/Notes
19	Record Type	See 4.1.4 Record Event Types
26	Data byte 0 LSB	See Table 4 to match record type to data
27	Data byte 1	
28	Data byte 2	
29	Data byte 3 (MSB)	

Which corresponds to the following bytes into the payload.

Details:		
LEN.	TYPE	VALUE
2	0x01	0x06
27	0xFF	0x77000100000000780DCB7C1398EC401C60039644C61860A000000
		00 Byte 19 Bytes 26-29

Note: The value meanings of Record Event types are showed into [Sentrius™ BT510 User Guide](#) section 4.1. Value or ID "01" stands for Temperature event.

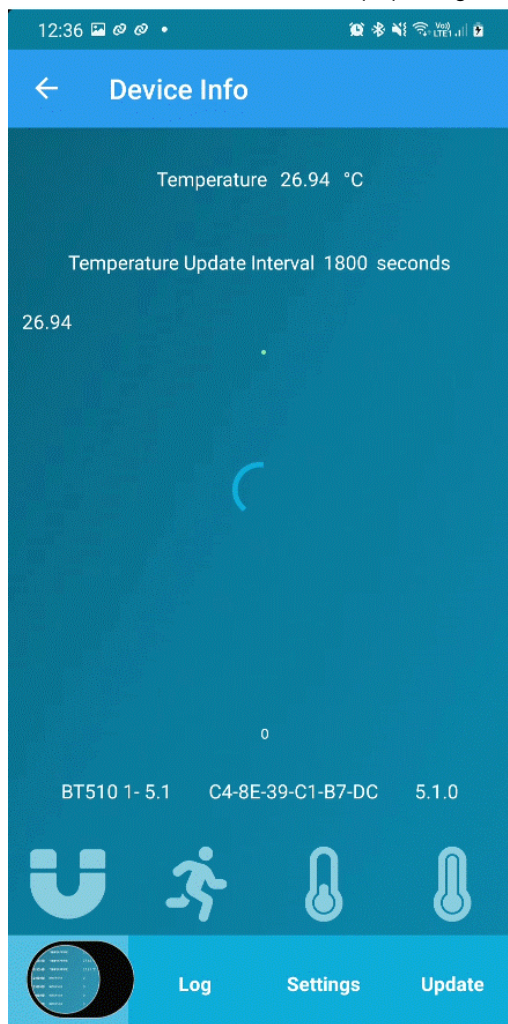
Table 4: Record event types

ID	Event	Data	Format
0	RESERVED	-	
1	TEMPERATURE	TEMPERATURE	Hundredths of degree C (signed 16-bit number)

5. The temperature Data is located into Bytes 26-29 is **0x860A0000**, but it needs to be converted to respect MSB and LSB order, which gives **0x00000A86**.

A last conversion into decimal is required to get the temperature measurement in Celsius: **0xA86 = 2694 = 26.94 °C**

6. You can crosscheck this value by opening the BT510 Mobile application and compare with the shown in the application.



6 Revision History

Version	Date	Notes	Contributor(s)	Approver
1.0	3 Feb 2023	Initial Release	Damien Fourcade	Dave Drogowski
2.0	5 May 2025	Ezurio rebranding	Sue White	Dave Drogowski

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