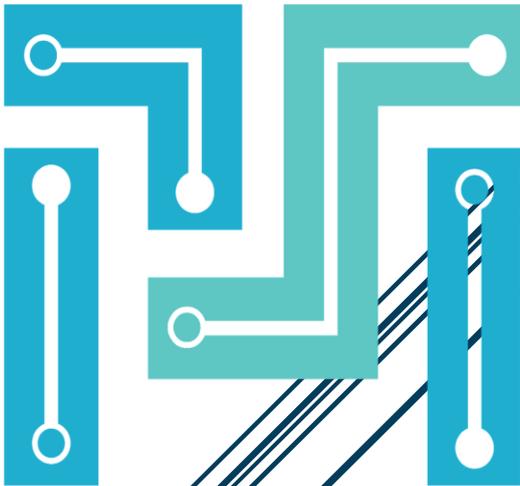


PALARUM

Beetle v3

Modes of Operations Manual



Mikro Star
You name it, We make it ***Tech***

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Revision History

REV	Date	Description	Developed by	Approved by
A	14 th February 2023	Modes Changing Manual for Beetle V3	MST-TC-003	

The main goal of this solution is fall prevention of the patients. The beetle device is attached to the smart socks used to monitor the movement of a patient. It is connected via Bluetooth to a mobile application, where any movement change alerts can be received.

This device has 3 modes of operation; Monitoring Mode, Storage Mode and Connected mode. These all modes are configured to optimize power consumption. Device also has a charging state, in which the device does not advertise for a Bluetooth connection and keeps charging when connected to a charger.



Overview

Palarum Beetle v3, is a medical device for determining the movement of patient. It is intended to be attached with patient socks and gives a standing alert if a patient stands.

This document presents BLE different modes and states changing instructions for Beetle v3.

Changing Modes

Installing App

Go to this [link nRF Connect for Mobile on playstore](#). Install the app in your mobile phone and open it as demonstrated in Fig No 1 and 2.

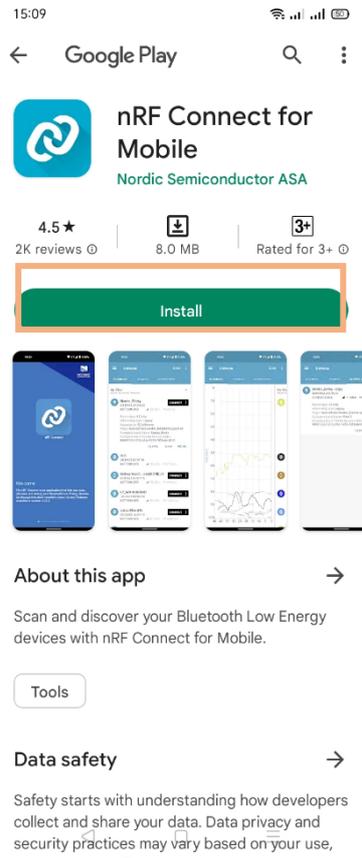


Figure No. 1
nRF Connect for Mobile on playstore

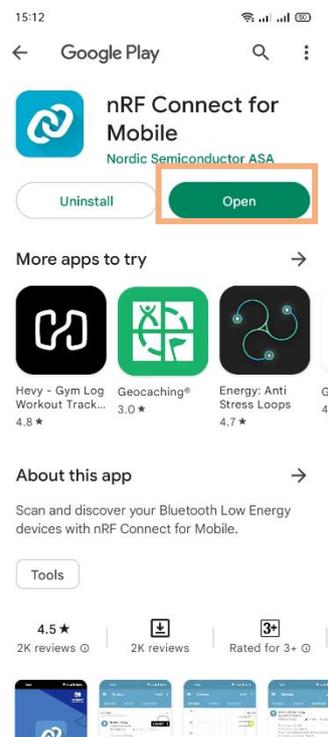


Figure No. 2
Open App

Connect to Device

First screen gives a prompt to enable Bluetooth if it is not already enabled (Fig. No. 3). After that we click on the scan button (Fig. No. 4) and all available devices are displayed on the screen with their public information (Fig. No. 5).

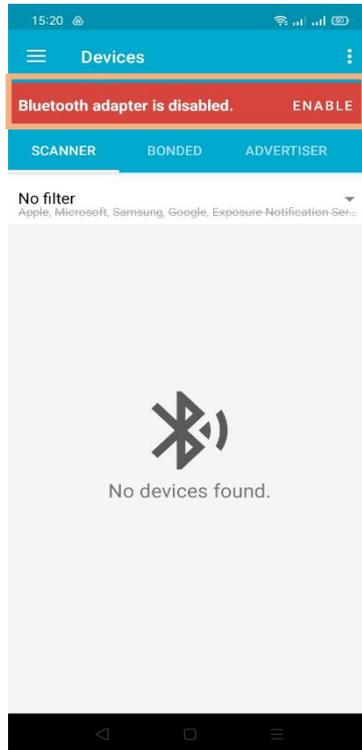


Figure No. 3
Home screen

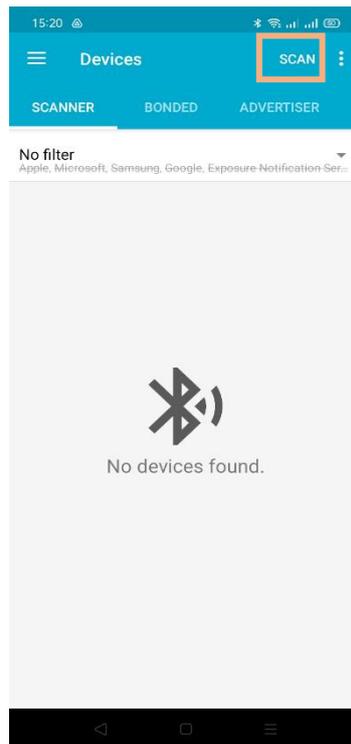


Figure No. 4
Scan Bluetooth Devices

After Install

“Palarum Unnamed” device will also be shown here if it is in advertising mode. All Palarum devices have the same name but different MAC addresses as shown in Fig. No. 5. If we slide the screen to the right, we can see the signal strength graph too in real time (Fig. No. 6). Click on the connect button next to the Palarum device name to establish a connection with it, the green LED of the device will light up for 5 seconds.

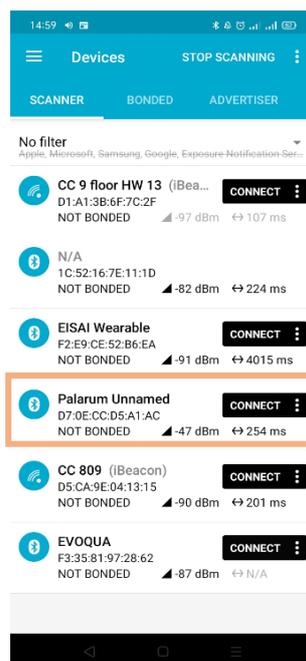


Figure No. 5
Available Devices

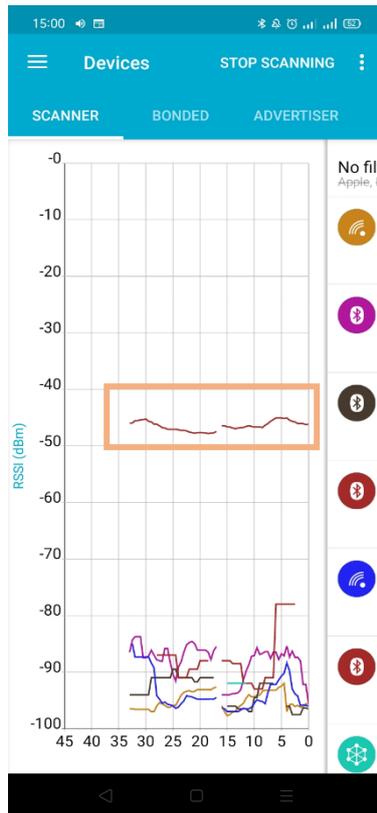


Figure No. 6
Signal Strength Graph



Figure No. 7
Available scanned Devices

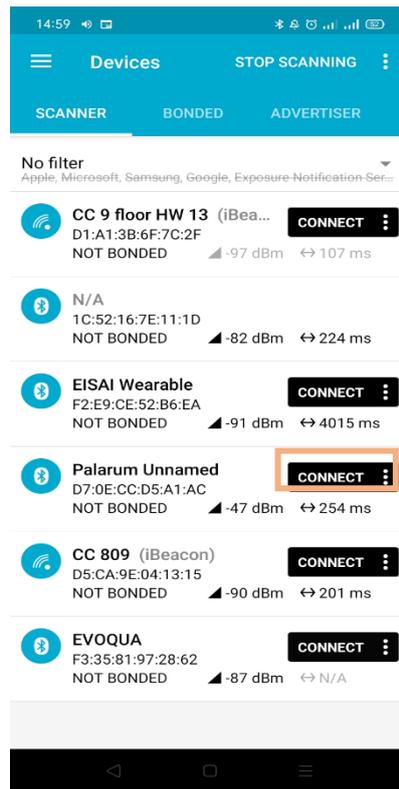


Figure No. 8
Available scanned Devices

Send Commands

New tab opens if device is connected. Click on Unknown Service that is highlighted in Fig. 6. In Fig. 7. read (downward arrow icon) and write (upward arrow icon) symbols are shown on left and right side respectively. Value: 0x0n (i.e., n can be any integer from 1 to 4) appears below by clicking on read icon; that shows the last command value that was received by beetle.

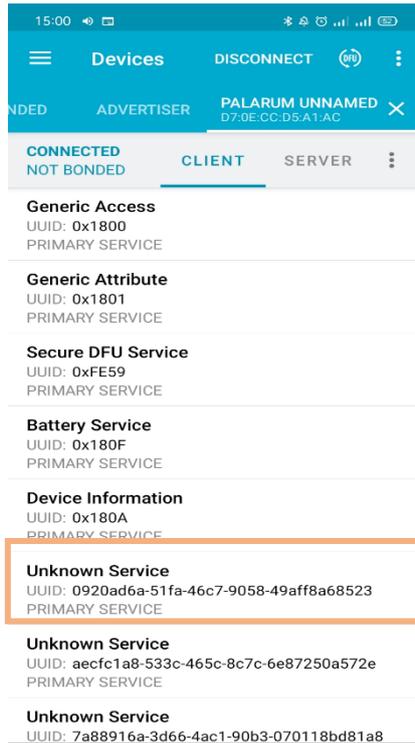


Figure No. 6
Connected Device Tab

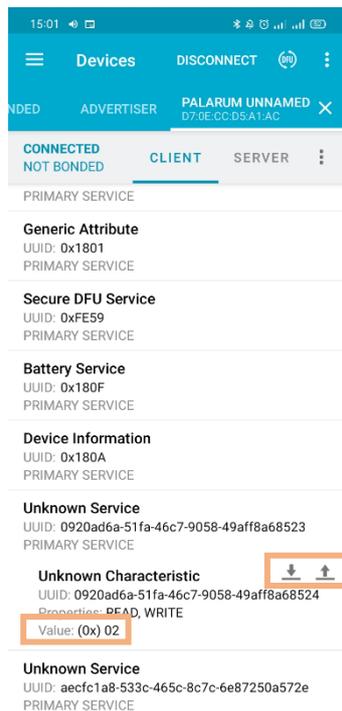


Figure No. 9
Read and Write Buttons

If we click on upward arrow icon new window pops up as shown in Fig. No. 8. Insert appropriate value according to Table No. 1 to change the mode of beetle as shown in Fig. 9.

States	Description	Command Value
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Charging State	The system will transition to the charging state when the charger is connected. BLE Radio is turned off.	N/A
Always ON Mode	The device keeps advertising until connected and other command is sent.	0x04
Storage Mode	The system can enter this state by a BLE command and will stay in this state until a charger is connected. While in storage state the system will go in to ultralow power mode.	0x02
Monitoring Mode	The monitoring state is the normal state of the system. This state consists of 3 sub states Advertising, Power Safe and Connected. When the Monitoring state is entered will the Advertising sub-state always be the initial state. Any BLE disconnect in this state will bring the system back to the Advertising sub-state.	0x01
1) Advertising Mode	While in advertising state the system will advertise to nearby BLE masters that it is possible to connected to the system. If a connection is made the system will transition to the sub-state Idle. If there are made no connection, and the IMU detect no motion for 5 minutes will the system transition to the sub-state Power safe.	Sub-state of Monitoring Mode
2) Power Safe State	In this will the system will stop advertising and conserve power. The IMU will still be running and detecting motion. If motion is detected will the system transition to the advertising state. (Can be entered in this state by command or by being in idle state for 5 minutes without any connection)	0x03 Sub-state of Monitoring Mode
3) Connected State	When the system enters this state, the signal will LED light up for 5 seconds. While in the connected state it is possible to activate the sensors and get the data.	Sub-state of Monitoring Mode

Table No. 1
States and Modes

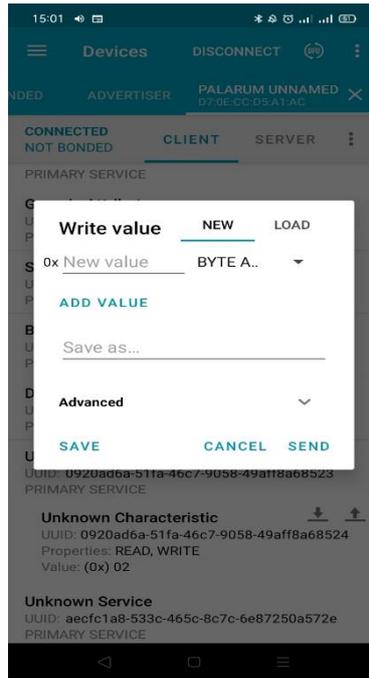


Figure No. 8
Write Value Window

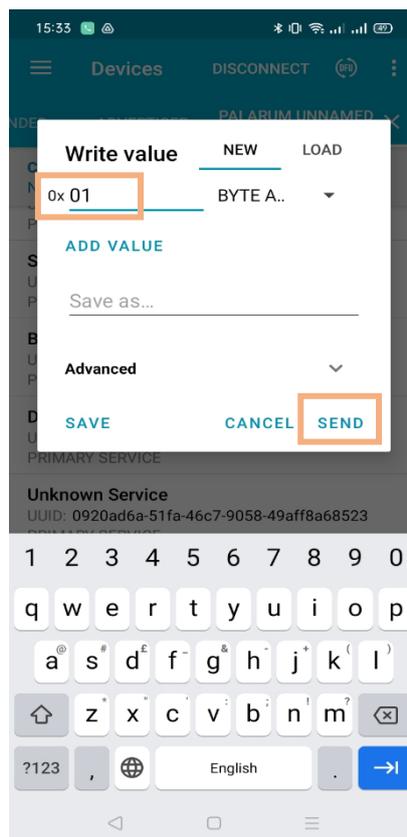


Figure No. 9
Mode Configuration

Validation

We can click again on downward arrow icon to check that command has been sent successfully (Fig. No. 10). If screen slides rightward, we can see the info of all the communication. In Fig. No. 11 we can see the reports of different commands that were sent.

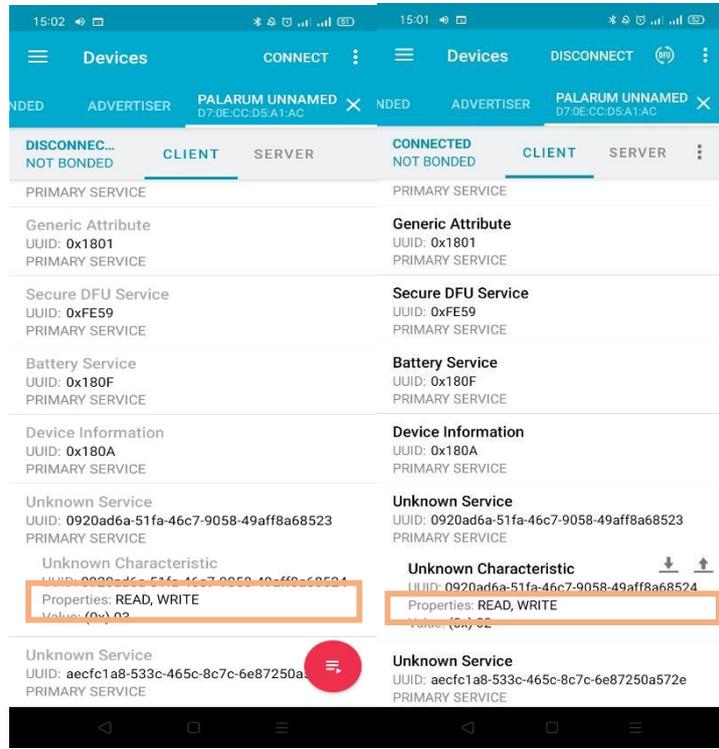


Figure No. 10
Last Command

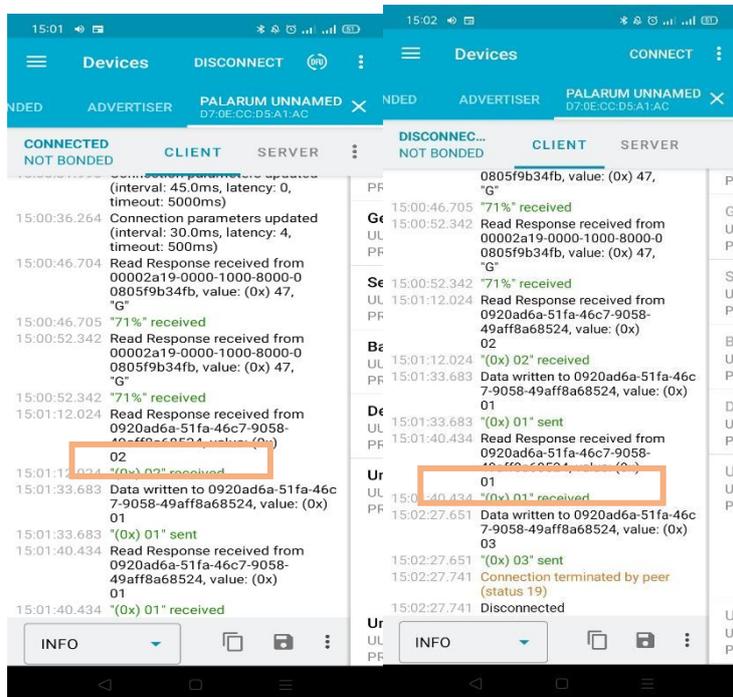


Figure No. 11
Commands Info

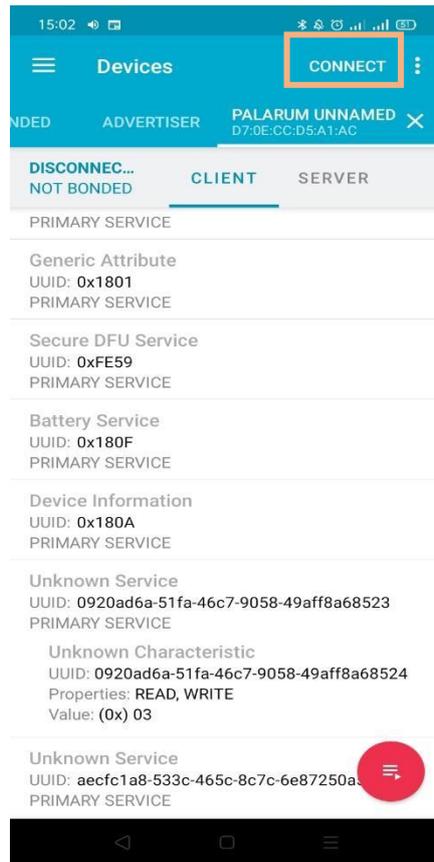


Figure No. 11
Connect and Disconnect Button on this window too

Summary

This document consists of instructions on how we can change beetle modes of operation by using nRF Connect for Mobile application.

FCC Warning

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.

Any Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Specific Absorption Rate (SAR) information:

This Palarum Beetle meets the government's requirements for exposure to radio waves. The guidelines are based on standards that were developed by independent scientific organizations through periodic and thorough evaluation of scientific studies. The standards include a substantial safety margin designed to assure the safety of all persons regardless of age or health.

FCC RF Exposure Information and Statement

The SAR limit of USA (FCC) is 1.6 W/kg averaged over one gram of tissue. Device types: Palarum Beetle (FCC ID: 2BAFT-PUPBTLV3) has also been tested against this SAR limit. The highest SAR value reported under this standard during product certification for use worn on the body is 0.029W/kg. This device was tested for typical body-worn operations with the back of the handset kept 0mm from the body. To maintain compliance with FCC RF exposure requirements, use accessories that maintain a 0mm separation distance between the user's body and the back of the handset. The use of belt clips, holsters and similar accessories should not contain metallic components in its assembly. The use of accessories that do not satisfy these requirements may not comply with FCC RF exposure requirements, and should be avoided.

Body-worn Operation

This device was tested for typical body-worn operations. To comply with RF exposure requirements, a minimum separation distance of 0mm must be maintained between the user's body and the handset, including the antenna. Third-party belt-clips, holsters, and similar accessories used by this device should not contain any metallic components. Body-worn accessories that do not meet these requirements may not comply with RF exposure requirements and should be avoided. Use only the supplied or an approved antenna.