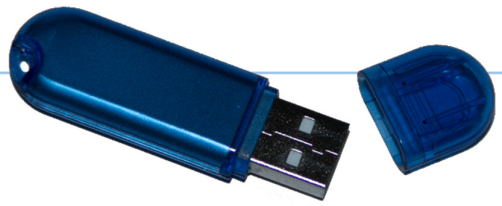
EDTRACKER®

Internal Product Specification

EDTracker Wireless Dongle



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Revision History

Version No.	Issue Date	Author(s)	Summary of revisions
0.1	7 Dec 2016	D. Howell	Initial draft for review
0.2	30 Jan 2017	D. Howell	Updated with some technical details in the specifications table
0.3	27 Feb 2017	D. Howell	Updated to reflect new (lower) power setting
0.4	28 Mar 2017	D. Howell	Corrected duty cycle
1.0	20 May 2017	D. Howell	Baselined for final release

References

Document	Version	Author(s)	Link (where applicable)

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1 Introduction

The *EDTracker Pro Dongle* is part of a head tracking solution for capturing a person's head motion in 3 DOF (Degrees of Freedom). A separate device (*EDTracker Pro Wireless*) transmits the positional information wirelessly to the USB dongle, which is inserted into a PC. The user's head movements are represented to the PC as 3-axis joystick positions, the intention being that the movements are then reflected within 3rd party games to allow the user to reflect their real-world head movement as virtual head movement in-game.

The product specification relates to the USB dongle only; a separate specification details the *EDTracker Pro Wireless* device.

While conceptually the dongle might be considered the "receiver" for the solution, there is 2-way traffic between the devices for the purposes of configuration.

The device transmits and receives within the 2.4GHz ISM RF band, using GFSK digital modulation. The device does not perform any frequency hopping.

This document is **NOT** intended to be an End User Guide – it is a technical document for internal use and for the purposes of 3rd party testing, certification and/or accreditation ("Operating Description" document for the purposes of FCC and IC certification).

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2 Specifications

Product Details				
Model Number	EDTDGL001			
Model Name	EDTracker Wireless Dongle			
Physical Characteristics	**Min**	**Value**	**Max**	**Unit**
Width	-	17	-	mm
Length	-	59	-	mm
Height	-	10	-	mm
Weight	-	6	-	g
Operating Temperature	-40	-	85	deg C
Electrical Characteristics	**Min**	**Typical**	**Max**	**Unit**
DC Supply Voltage	3.7	5.0	5.25	v
Standby Current	-	500	-	uA
Typical Current (Transmission @ 0dBm)	-	13	-	mA
Typical Current (Receive)	-	11	-	mA
RF Characteristics	**Min**	**Typical**	**Max**	**Unit**
Operating Frequency	2.4GHz ISM			
Modulation	GFSK			
Channel Access protocol (carrier type)	IC Vendor Proprietary (Nordic Semiconductor)			
Transceiver Operation	Simplex			
Duty Cycle		<2		%
Antenna Type	PCB Copper Trace (~32.5mm)			
Transmit Power	-	-	0.25 *(-6)*	mW *(dBm)*
Signal Range (outdoor)	0	-	100	m
Signal Range (indoor)	-	20	-	m
Data Rate	250kbps			
Frequency Range	2403	-	2481	MHz
No. of Channels	-	27	-	
Channel Bandwidth	-	1	-	MHz
Channel Spacing	-	3	-	MHz
Receiver Sensitivity (@250kbps)	-	-106	-	dBm
USB Characteristics	**Value**			
USB Class	USB 2.0			
Device Class	HID (Human Interaction Device) – Joystick			
USB Vendor ID	0x16D0			
USB Product ID	0x0AEC			

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2.1 Wireless Channel List

The following table shows the centre frequency for each software-selected channel available on the device

Channel No.	Frequency (MHz)
1	2403
2	2406
3	2409
4	2412
5	2415
6	2418
7	2421
8	2424
9	2427
10	2430
11	2433
12	2436
13	2439
14	2442
15	2445
16	2448
17	2451
18	2454
19	2457
20	2460
21	2463
22	2466
23	2469
24	2472
25	2475
26	2478
27	2481

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2.2 Product Images

(NB: Grid in photos is 50x50mm)

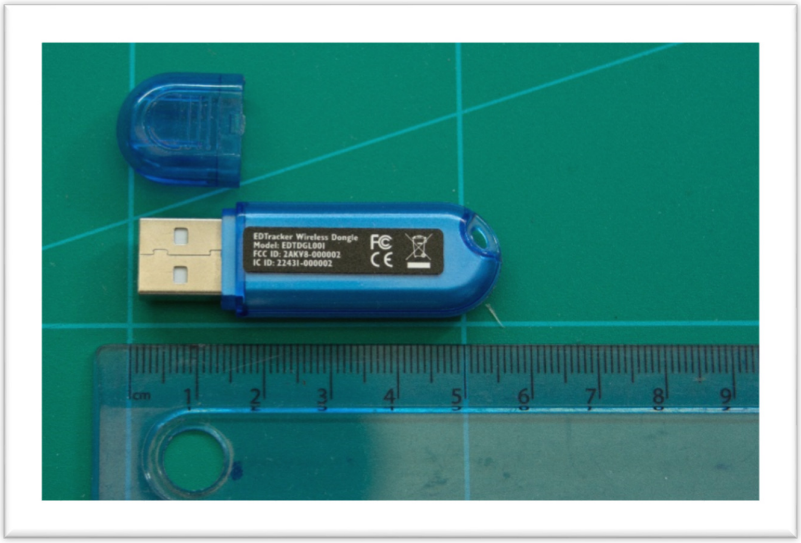

Figure 1- Dongle in plastic enclosure

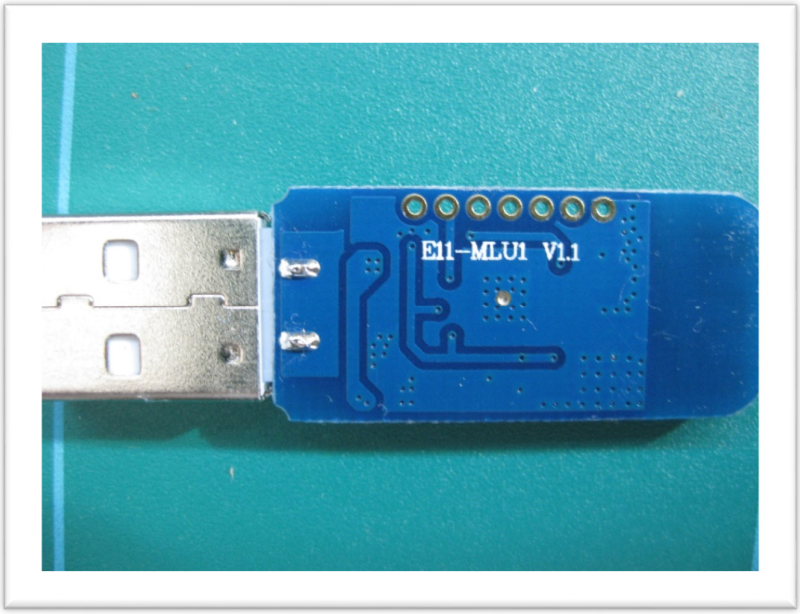

Figure 2 - Dongle (PCB, underside)

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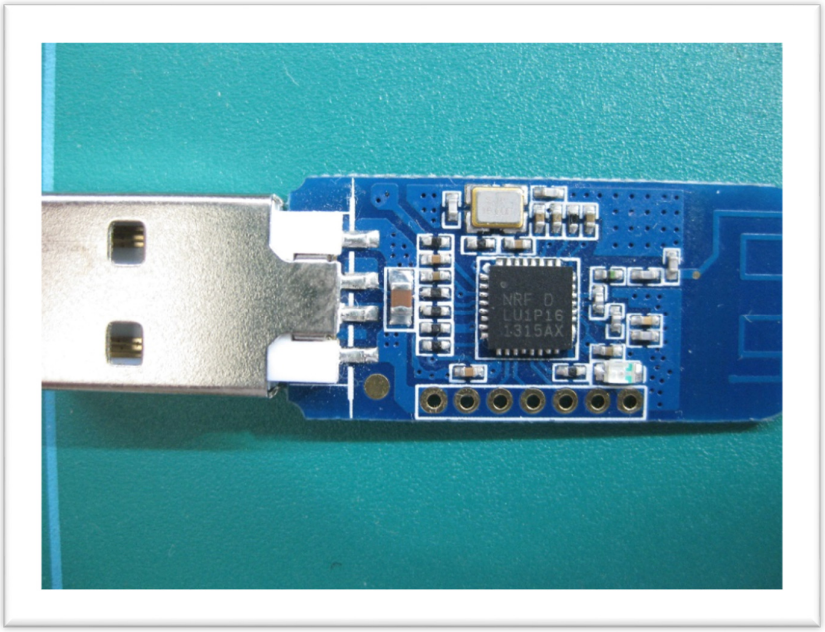

Figure 3 - Dongle (PCB, topside)

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2.3 Antenna

The device makes use of a copper trace antenna incorporated into the PCB top layer. The PCB incorporates an antenna balancing and matching network between the Nordic NRF24 transceiver IC and the antenna.

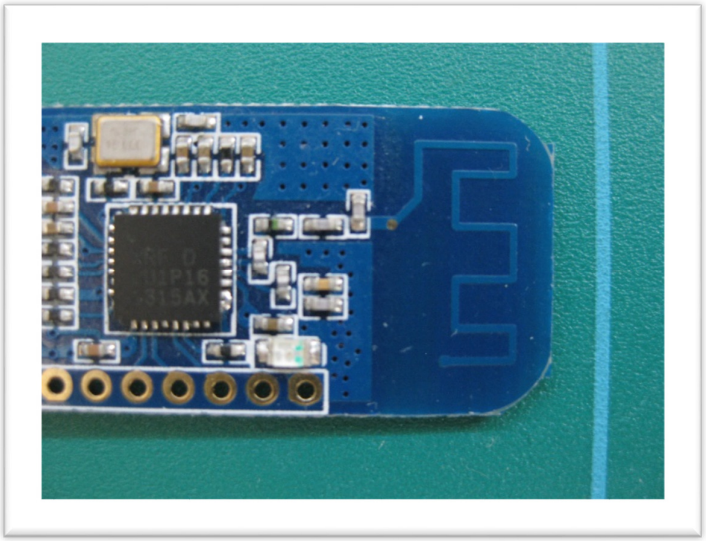

Figure 4 - Close up of antenna configuration

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3 Circuit Functions

The EDTracker Wireless Dongle incorporates the following circuit functions :

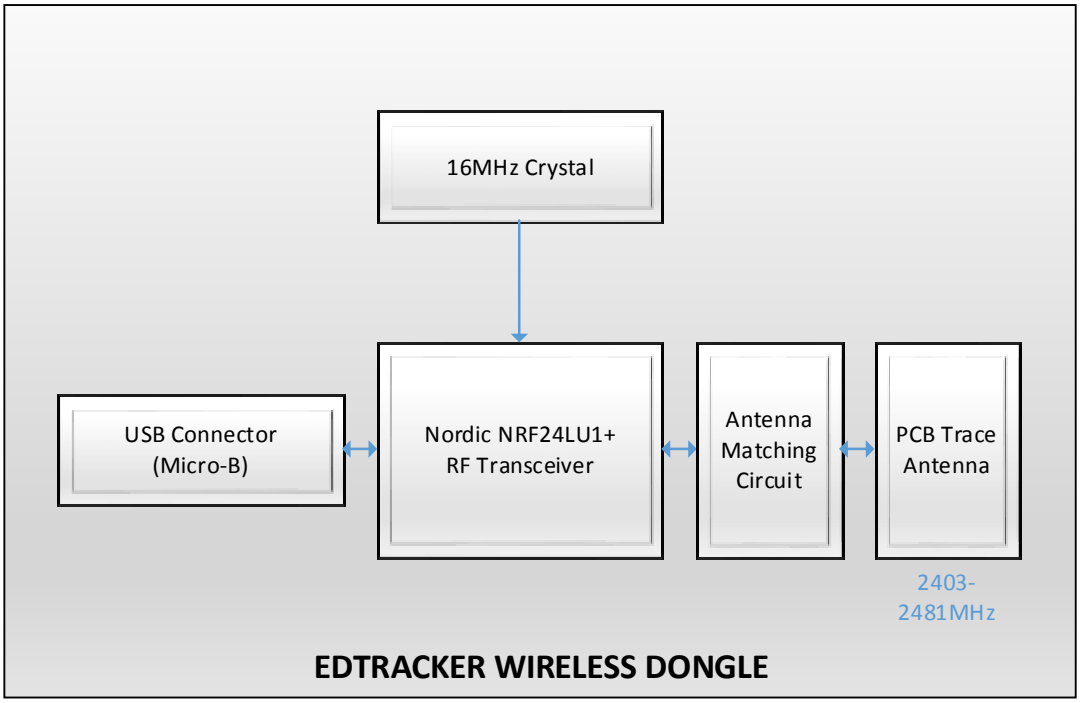

Figure 5 - Circuit Block Diagram

3.1 USB Connector

The device sources power directly from the USB connector. The entire board logic runs at 5v. USB serial data lines run direct to the Nordic IC.

3.2 Nordic Transceiver

The Nordic NRF24LU1+ incorporates the microcontroller function along with a proprietary Nordic 2.4GHz wireless transceiver to provide a single IC solution for the device. The IC makes use of an external 16MHz reference clock for all its functions.

3.3 Antenna

The antenna is connected via a matching circuit to match the NRF line drivers to the required 50ohm impedance.

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4 Guidelines for Use

The *EDTracker Wireless Dongle* is intended to be plugged into a PC running the Microsoft Windows operating system. It presents what the computer believes to be a joystick to the operating system. The dongle receives the wireless signals from the *EDTracker Pro Wireless* device and represents movement of that device onto the 3 axes of the virtual joystick. Moving the *EDTracker Pro Wireless* around its axes will represent motion on the following joystick axes :

Device Axis	Virtual Joystick Axis
Yaw	X
Pitch	Y
Roll	Z

Configuration of the device is performed through an EDTracker software utility. This software can be used to pair the device with an EDTracker Pro, change the wireless channel used and also put the device into wireless transmission test mode for regulatory testing.

A User Guide is available that provides detailed instructions on using the software necessary to operate the device.

4.1 Turning On

Insert the device into an available USB port on a Windows-based PC (Windows Vista/7/8/10 recommended).

Once inserted into an available USB port on a PC, the device automatically commences functionality.

Removing the device from the USB port will power it down. It has no internal battery supply.

The LED on the device can be used to provide basic state information :

LED Status	Description
Off	Device is unpowered or is not detecting a signal from a corresponding EDTracker device
Flashing	Device is powered but unpaired
Solid	Device is powered and has an established pairing with an EDTracker device

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4.2 Wireless Operation

EDTracker Wireless Dongles need to be "paired" with a corresponding *EDTracker Pro Wireless* device before they can be used as a gaming peripheral. Pairing uniquely ties a dongle to the EDTracker Pro Wireless device for the period in which they both maintain power. All other EDTracker traffic from other devices within range will be ignored by both devices – they will only respond to their corresponding paired device.

Following initial power-on, an *EDTracker Wireless Dongle* will be always be unpaired. It does not store pairing information internally between power cycles.

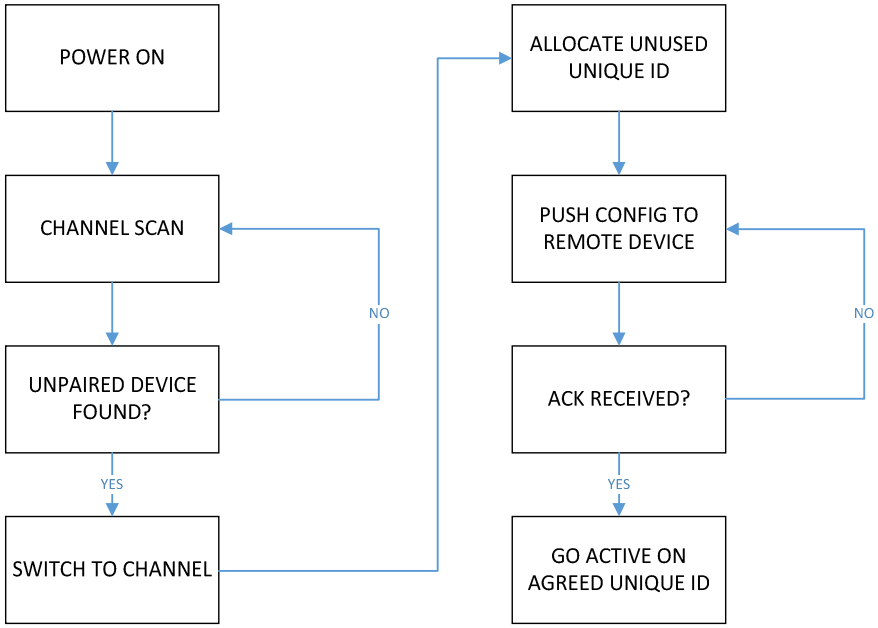

Figure 6 – Wireless negotiation logic (dongle)

When a dongle is plugged in it repeatedly scans all wireless channels sequentially for approximately 1.5 seconds. During this period, it tracks the details of all *EDTracker Pro Wireless* devices that it finds broadcasting – both paired and unpaired devices – making a note of the RF channel upon which the device is located, and any unique pairing code (if the device is showing as already paired).

At the end of the scanning period, if no unpaired device is found, the dongle repeats its scanning process indefinitely until one is found.

Assuming an unpaired *EDTracker Pro Wireless* device is found, the dongle changes to the appropriate target channel and chooses a suitable unique identifier that will not conflict with any other discovered devices. The dongle negotiates this identifier with the *EDTracker Pro Wireless* device. Assuming the negotiation succeeds (acknowledged by the remote device), both the dongle and the remote *EDTracker Pro Wireless* device switch to the unique identifier for all subsequent communications.

At this point, the devices are considered "paired". Unplugging the dongle or turning off the *EDTracker Pro Wireless* device will clear the binding and the devices will need to be re-paired.

Once paired, the EDTracker UI software can be used to configure various aspects of the device, including changing the wireless channel.

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4.3 Storage & Shipping

The device emits no RF signals when unplugged; it has no internal power source.

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