SPARROW | LINK

Sparrow Link Specifications

(tAN®: Transcutaneous Auricular Neurostimulation)

Sparrow Link is an extension of the FDA-cleared Sparrow Ascent wearable neurostimulation device. Sparrow Link is an investigational platform that allows researchers to customize the non-invasive Transcutaneous Auricular Neurostimulation (tAN®) therapy stimulation parameters output by the Sparrow Link Pulse Generator. The Sparrow Link platform is intended for use in studies approved by the corresponding competent authorities in accordance with all applicable local laws and regulations.

The Sparrow Link Platform is supported by the Sparrow Link Pulse Generator, Sparrow Link Researcher App, Sparrow Link Hub, and Sparrow Link Application Programming Interface (API). Researchers may customize the Sparrow Link Pulse Generator's device settings and stimulation parameters output by using the Sparrow Link Researcher Application or Sparrow Link Hub with API developed by Spark Biomedical, Inc.

The **Sparrow Link Pulse Generator** delivers targeted neurostimulation.*

The **Sparrow Link Researcher App** configures stimulation parameters and retrieves Pulse Generator logs.

The **Sparrow Link Hub** enables stimulation triggering via software or hardware interfaces.

The **Sparrow Link API** enables Python scripting of advanced device settings and programmatic delivery of stimulation.

**The Sparrow Link Pulse Generator requires Sparrow Ascent Earpieces and Cable.*

Sparrow Link Specifications

Sparrow Link Pulse Generator – model 910

The Sparrow Link Pulse Generator is a hand-held, battery-powered device designed to be carried while receiving tAN® therapy. The Sparrow Link Pulse Generator is compatible with Sparrow Ascent components and accessories. The Pulse Generator delivers current controlled biphasic stimulation to the Sparrow Ascent Earpiece via the Sparrow Ascent Cable. Sparrow Ascent Earpieces interface with the vagus nerve at the Inner Electrode and the trigeminal nerve at the Outer Electrode.

Connect with our team to learn how Sparrow Link can support your research:
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The Sparrow Link Pulse Generator pairs with the Sparrow Link Researcher App or Sparrow Link Hub via Bluetooth Low Energy (BLE) to receive custom modifications to the default stimulation settings. See Table 1 below for the full range of output configurations.

Table 1. Sparrow Link Pulse Generator Stimulation Outputs for the Inner and Outer Electrodes

Settings	Default		Custom Range	Step Size or Values
	Inner Electrode	Outer Electrode	Inner and Outer Electrode	Inner and Outer Electrode
Amplitude*	0.0 mA	0.0 mA	0 mA – 5.0 mA	Step size of 0.1 mA
Pulse Width**	350 µS	250 µS	50 µS – 750 µS	50, 100, 150, 250, 350, 500, 750 µS
Frequency	30 Hz	100 Hz	1 Hz – 150 Hz	1, 5, 10, 15, 20, 25, 30, 40, 50, 75, 100, 125, 150 Hz
Cycle Time	On 5 minutes Off 10 seconds		On 102 mS – 24 hours Off 0 mS – 24 hours	1 sec, 1 min, 1 hour
Ramping Duration***	Up 1 second per 0.1 mA Down 3 seconds		Up 50 mS – 60 sec Down 50 mS – 3 sec	Step size of 1 mS
Passive Sham	Off	Off	Passive sham can be enabled for each electrode independently	N/A
Intra Phase PW	125 +/- 25 µS		N/A	N/A
Max. Voltage	95 V		N/A	N/A

Unless otherwise specified, outputs shall be within a tolerance of +/- 15%.

**For Amplitude, the tolerance shall be +/- 15% or 0.1mA, whichever is greater.*

*** For Pulse Width, the tolerance shall be +/- 15% or 15 µs, whichever is greater.*

****For default ramping mode, for custom ramping mode, the minimum cycle ON time must be equal to or greater than the ramping up duration.*

Note: For Sparrow Link patient application instructions for tAN® therapy, cautions, and warnings, see the Sparrow Link Instructions for Use.

Sparrow Link Researcher App – Model 930-S

The Sparrow Link Researcher App pairs with the Sparrow Link Controller Pulse Generator via BLE to:

- Modify stimulation output parameters
- Enable or disable error notifications
- Retrieve Sparrow Link Pulse Generator device history logs
- Enable single or dual channel passive sham on the Sparrow Link Pulse Generator
- Update the firmware of the Sparrow Link Pulse Generator as new releases became available

The Sparrow Link Researcher App is available on Android platforms only. The Sparrow Link Researcher App is best suited for users who do not need triggering made possible by the Hub and API.

Sparrow Link Hub – Model 940

Connect the Sparrow Link Hub to your PC with a USB-C to USB-A cable (not included). Then, using the built-in Bluetooth Low Energy (BLE) communication protocol, send Sparrow Link API commands to the Sparrow Link Pulse Generator via the Hub.

The Sparrow Link Hub pairs with the Sparrow Link Pulse Generator via BLE to:

- Modify stimulation output parameters, including amplitude, pulse width, frequency, duty cycle, and ramping duration
- Enable or disable error notifications on the Sparrow Link Pulse Generator
- Enable single or dual channel passive sham on the Sparrow Link Pulse Generator
- Enable or disable the Sparrow Link Pulse Generator lock screen
- Programmatically modify stimulation output by the Sparrow Link Pulse Generator
- Enable trigger mode, which allows external signal inputs into the Hub to trigger stimulation at the Inner or Outer areas of the Sparrow Ascent Earpiece when paired with the Sparrow Link Pulse Generator

The Sparrow Link Hub has two BNC connections to receive input signals for stimulation triggering. Triggering latency under general operating condition is 50 microseconds.

Table 2. Sparrow Link Hub Hardware Triggering Input Voltage

Trigger Input Voltage	Min	Max	Unit
Positive Threshold	1.75	3.30	Volts
Negative Threshold	-0.3	1.74	Volts
Connection Type	BNC	BNC	N/A

About Spark Biomedical

Spark Biomedical, Inc. is a leading U.S.-based medical device developer committed to unlocking the potential of bioelectric medicine and bringing to market novel wearable neurostimulation treatments for mental health, women's health, hemostasis, pediatrics, and chronic pain.

Leveraging its neuroscience and engineering expertise, Spark empowers healthcare providers and researchers with innovative, evidence-based tools designed to address complex care situations exceeding existing treatment options. Spark Biomedical is paving a better way forward for the future of patient care and medical technology.

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