COREKINECT NATLRA1 LoRa Based Vehicle Asset Tracker User Manual

Contents

COREKINECT

COREKINECT NATLRA1 LoRa Based Vehicle Asset Tracker

Federal Communication Commission Statement

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.
- 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.

FCC Caution:
Any changes or modifications not expressly approved by the party responsible for compliance could void the user’s authority to operate this equipment

ISED RF Exposure Guidance Statement:
In order to comply with FCC/ISED RF Exposure requirements, this device must be installed to provide at least 20

cm separation from the human body at all times.
Afin de se conformer aux exigences d'exposition RF FCC / ISED, cet appareil doit être installé pour fournir au moins 20 cm de séparation du corps humain en tout temps.

NOTE:

The CoreKinect LoRa Based Vehicle Asset Tracker and location Name complies with Industry Canada RSS 247 standard. See RSS GEN 7.1.5. The term "IC:" before the certification/registration number only signifies that registration was performed based on a Declaration of Conformity indicating that Industry Canada technical specifications were met. The term "IC:" before the certification/registration number does not imply that Industry Canada approved the equipment.

ISED RSS Notice:

This device complies with Industry Canada's license-exempt RSSs. Operation is subject to the following two conditions:

1. This device may not cause interference;
2. This device must accept any interference, including interference that may cause undesired operation of the device.

Theory of Operation/Technical Description

The device has only one user-serviceable part, which is the battery. The device has a reed switch as the only user control, which is used to trigger a position capture. All operation is self contained. The device will only use one radio.

RF Circuit Function 915MHz

The main microcontroller assembles data packets for the Semtech SX1272 transceiver to modulate the data using LoRa modulation. LoRa modulation is a derivative of Chirp Spread Spectrum. The transceiver uses a pSemi 4259-63 RF switch to control if the custom trace antenna is connected to the receive or transmit pins of the SX1272.

Antenna Setup 915MHz

The antenna is not changeable by the user, it is a copper trace in the PCB and contained within the device enclosure. The antenna is connected to a filter network, then an RF switch (pSemi 4259-63), then either the receive or transmit filter network, then to the receive or transmit pins on the SX1272.

Transceivers and Antennae

Chip	SX1272
Modulation	LoRa: Chirp Spread Spectrum
Antenna Gain	0dBi
TX Frequency	902.3-914.2MHz

915MHz Channels

There are 64 channels with 125kHz bandwidth each starting at 902.3MHz and increasing by 200kHz up to 914.9MHz. Additionally, there are 8 channels with 500kHz bandwidth each starting at 903.0 and increasing by 1.6MHz up to 914.2MHz. The channel frequency specifies the center frequency of the channel. Table showed on following pages. The device only sends small packets of 255 bytes or less, infrequently. The device randomly selects one of the 72 channels (0-71) when it needs to send data. Depending on the channel selected it will use

the bandwidth assigned to that channel (125kHz for channels 0-63 and 500kHz for channels 64-71). The device will send the entire packet on that 1 channel in under 400 milliseconds. The device will not attempt to transmit again until after 20 seconds have passed (it will be a random time between 20 and 50 seconds) if another data packet has been queued. The choice between 125kHz channel or 500 kHz channel is random, with 64 125kHz channels and 8 500kHz channels the device is much more likely to transmit on a 125kHz channel. The device will make sure not to reuse the last channel transmitted on when picking the new random channel.

Steps to Transmit

1. Randomly select a channel between 0-71 making sure it was not used on the last transmit
    - The gateway could limit this to any grouping of 8 contiguous channels when the device joins the network, but when attempting to join the network for the first time the device will use all 72 channels. Each block of 8 125kHz channels is assigned 1 500kHz channel. The channel blocks of 8+1 are 0-7+64, 8-15 +65, 16-23 +66,
      24- 31 +67, 32-39 +68, 40-47 +69, 48- 53 +70, and 54-63 +71.
2. Transmit 1 packet of data on that channel in under 400milliseconds
3. Switch to receive mode and listen for gateway to respond within 2 seconds
4. Turn off transceiver for a random time between 20-50 seconds
5. Check if another packet needs to be sent
    - if a packet is ready to send go to step 1 and repeat
    - If no packet to send, transceiver is kept off

Channel	Frequency (MHz)	Bandwidth (kHz)
0	902.3	125
1	902.5	125
2	902.7	125
3	902.9	125
4	903.1	125
5	903.3	125
6	903.5	125
7	903.7	125
8	903.9	125
9	904.1	125
10	904.3	125
11	904.5	125
12	904.7	125
13	904.9	125
14	905.1	125
15	905.3	125
16	905.5	125
17	905.7	125
18	905.9	125
19	906.1	125
20	906.3	125
21	906.5	125
22	906.7	125
23	906.9	125

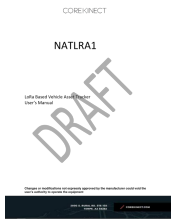
24	907.1	125
25	907.3	125
26	907.5	125
27	907.7	125
28	907.9	125
29	908.1	125
30	908.3	125
31	908.5	125
32	908.7	125
33	908.9	125
34	909.1	125
35	909.3	125
36	909.5	125
37	909.7	125
38	909.9	125
39	910.1	125
40	910.3	125
41	910.5	125
42	910.7	125
43	910.9	125
44	911.1	125
45	911.3	125
46	911.5	125
47	911.7	125
48	911.9	125

49	912.1	125
50	912.3	125
51	912.5	125
52	912.7	125
53	912.9	125
54	913.1	125
55	913.3	125
56	913.5	125
57	913.7	125
58	913.9	125
59	914.1	125
60	914.3	125
61	914.5	125
62	914.7	125
63	914.9	125
64	903.0	500
65	904.6	500
66	906.2	500
67	907.8	500
68	909.4	500
69	911.0	500
70	912.6	500
71	914.2	500

Device Specifications

Frequency	902-914Mhz
Antenna Gain	
RF Sensitivity	-137dBm
Battery Type	Lithium Thionyl Chloride Non-Rechargeable – 19,000mAh
GPS Connectivity	Tri-mode GPS/Galileo GLONASS. Geofencing and IMESS/QZSS optimization. 72 Channel
Network Protocol	LoRa
Accelerometer	3 axis, 2g/4g/8g/16g ultra low power MEMS
Temperature Range	-40 to 85C
Environmental Rating	IP68
Dimensions	94mm x 84mm x 52mm

Documents / Resources

	**COREKINECT NATLRA1 LoRa Based Vehicle Asset Tracker** [pdf] User Manual NATLRA1, 2ARKMNATLRA1, NATLRA1 LoRa Based Vehicle Asset Tracker, LoRa Based Vehicle Asset Tracker, Vehicle Asset Tracker, Asset Tracker