



PLACEPOD[®] SENSOR COMMUNICATIONS PROTOCOL

This document describes the structure of messages exchanged between the PlacePod vehicle detection and vehicle counting sensors and the LoRa[®] Server.

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1 COPYRIGHT & WARRANTY INFORMATION

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PNI Sensor
2331 Circadian Way
Santa Rosa, CA 95407, USA
Tel: (707) 566-2260
Fax: (707) 566-2261

Warranty and Limitation of Liability – PlacePod Vehicle Detection Sensor (“Product”). PNI Sensor (“PNI”) manufactures its Products from parts and components that are new or equivalent to new in performance. PNI warrants that each Product to be delivered hereunder, if properly used, will, for 90 days following the date of shipment be free from defects in material and workmanship and will operate in accordance with PNI’s published specifications and documentation for the Product in effect at time of order. Any Product that is non-functional and unresponsive to firmware and software updates will be considered failed hardware units and will be replaced at no charge. This warranty includes 90 days of debugging maintenance for customers that use the PNI cloud-based Parking Management software application to manage PNI’s Product.

This warranty does not cover wear and tear due to normal use, or damage to the Product as the result of improper installation, misuse, neglect of care, alteration, vandalism, theft, accident, or unauthorized repair.

The above warranty is in lieu of any other warranty, whether express, implied, or statutory, including but not limited to, any warranty of merchantability, fitness for any particular purpose, or any warranty otherwise arising out of any proposal, specification, or sample. PNI neither assumes nor authorizes any person to assume for it any other liability.

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Except for the breach of warranty remedies set forth herein PNI shall have no liability for any indirect or speculative damages (including, but not limited to, consequential, incidental, punitive and special damages) relating to the use of or inability to use this Product, whether arising out of contract, negligence, tort, or under any warranty theory, or for infringement of any other party’s intellectual property rights, irrespective of whether PNI had advance notice of the possibility of any such damages, including, but not limited to, loss of use, revenue or profit. In no event shall PNI’s total liability for all claims regarding a Product exceed the price paid for the Product. PNI neither assumes nor authorizes any person to assume for it any other liabilities.

2 PAYLOAD INFORMATION

This document describes the structure of messages exchanged between the PNI PlacePod and the LoRa Network. PNI follows standard Cayenne Low Power Payload (LPP) Format (<https://mydevices.com/cayenne/docs/lora/#lora-cayenne-low-power-payload>) to deliver all packets across the LoRa network.

2.1 Uplink Packet Format

Details for PlacePod uplink messages.

Table 1: Uplink Payload Format

Size	Field	Description
1	data chan	Parking Sensor Uplink Data Channel
1	data type	Parking Sensor Uplink Data Type
N	data	Data

Table 2: Parking Sensor - Cayenne LPP Uplink Data Channel

Data Chan	Hex	Description	Data Type	Data Resolution
1	0x01	Recalibrate Response	1	
2	0x02	Temperature	103	0.1 °C
3	0x03	Battery	2	0.01 Volt
5	0x05	PNI Internal*	0	
6	0x06	PNI Internal*	0	
21	0x15	Parking Status	102	0(Vacant) or 1(Occupied)
28	0x1C	Deactivate Response	1	
33	0x21	Vehicle Count	0	1 count for 1 vehicle
55	0x37	Keep-Alive	102 or 0	
63	0x3F	Reboot Response	1	

* If these messages are observed please contact PNI with the message contents.

Table 3: Parking Sensor - Cayenne LPP Uplink Data Type

Data Type	Hex	Description	Data Size	Data Resolution
0	0x00	Digital Input	1	1
1	0x01	Digital Output	1	1
2	0x02	Analog Input	2	0.01 Signed
3	0x03	Analog Output	2	0.01 Signed
102	0x66	Presence Sensor	1	1
103	0x67	Temperature Sensor	2	0.1 °C Signed MSB

2.1.1 Recalibrate Response

Response payload for downlink recalibrate command.

Table 4: Reboot Payload Format

Type	Size	Field	Description	Value
uint8	1	data chan	data channel	0x01
uint8	1	data type	data type	0x01
uint8	1	data		0x00 or 0x01

Example Payload – “successful”

01 01 01

Example Payload – “failed”

01 01 00

2.1.2 Temperature

Temperature payload reports the temperature reading from the temperature sensor. Reported when temperature changes by $\pm 3^{\circ}\text{C}$.

Table 5: Temperature Payload Format

Type	Size	Field	Description	Value
uint8	1	data chan	temperature channel	0x02
uint8	1	data type	temperature type	0x67
int16	2	data	0.1 $^{\circ}\text{C}$	0x0000 – 0xFFFF

Example Payload – “24.0 $^{\circ}\text{C}$ ”

02 67 00 F0

2.1.3 Battery

Battery payload reports the estimate battery voltage reading. Reported when voltage changes by $\pm 0.01\text{V}$.

Table 6: Battery Payload Format

Type	Size	Field	Description	Value
uint8	1	data chan	battery channel	0x03
uint8	1	data type	battery type	0x02
int16	2	data	0.01 Volt	0x0000-0xFFFF

Example Payload – “3.5V”

03 02 01 5E

2.1.4 Parking Status

Parking status reports the current parking status, vacant (0) or occupied (1).

Table 7: Parking Status Payload Format

Type	Size	Field	Description	Value
uint8	1	data chan	channel	0x15
uint8	1	data type	type	0x66
uint8	1	data		0 (vacant) or 1 (occupied)

Example Payload – “vacant”

15 66 00

Example Payload – “occupied”

15 66 01

2.1.5 Deactivate Response

Response payload for downlink deactivate command.

Table 8: Deactivate Response Payload Format

Type	Size	Field	Description	Value
uint8	1	data chan	channel	0x1C
uint8	1	data type	type	0x01
uint8	1	data		0x01

Example Payload – “done”

1C 01 01

2.1.6 Vehicle Count

Vehicle Count payload reports number of passing vehicles detected. Data value range is 0 to 128 (0x80). Value 0 to 127 (0x7F) are valid count, value 128 (0x80) is a flag to indicate sensor reboot or recalibration.

Table 9: Deactivate Response Payload Format

Type	Size	Field	Description	Value
uint8	1	data chan	channel	0x21
uint8	1	data type	type	0x00
uint8	1	data		0x00 to 0x80

Example Payload – “Vehicle count 32”

21 00 20

Example Payload – “Sensor reboot or recalibration”

21 00 80

2.1.7 Keep-Alive

Keep-alive payload reports current parking status or vehicle count at fixed interval (default 1 hour interval). Data type 102 (0x66) indicates parking status, and type 0 means vehicle count.

Table 10: Keep-Alive Payload Format

Type	Size	Field	Description	Value
uint8	1	data chan	channel	0x37
uint8	1	data type	type	0x66 or 0x00
uint8	1	data		0x00 -0x80

Example Payload – “vacant”

37 66 00

Example Payload – “occupied”

37 66 01

Example Payload – “Car count 32”

37 00 20

Example Payload – “Sensor reboot or recalibration”

37 00 80

2.1.8 Reboot Response

Response payload for downlink reboot command.

Table 11: Reboot Response Payload Format

Type	Size	Field	Description	Value
uint8	1	data chan	channel	0x3F
uint8	1	data type	type	0x01
uint8	1	data		0x01

Example Payload – “done”

3F 01 01

2.2 Downlink Packet Format

Details for the available downlink messages for PlacePod.

Table 12: Downlink Payload Format

Size	Field	Description
1	data chan	Downlink Data Channel
2	data	Data (0.01 Precision)
1	0xFF	Reserved

Table 13: Parking Sensor – Cayenne LPP Downlink Data Channel

Data Chan	Hex	Description
1	0x01	Recalibrate
28	0x1C	Deactivate
63	0x3F	Reboot

2.2.1 Recalibrate Payload

This downlink command recalibrates the PlacePod for a vacant parking space.

Table 14: Recalibrate Payload Format

Type	Size	Field	Description	Value
uint8	1	data chan	data channel	0x01
int16	2	data	data	0x0000
uint8	1		Reserved	0xFF

Example Payload

01 00 00 FF

2.2.2 Deactivate Payload

This downlink command deactivates the PlacePod, disabling all LoRa communication.

Table 15: Deactivate Payload Format

Type	Size	Field	Description	Value
uint8	1	data chan	data channel	0x1C
int16	2	data	data	0x0000
uint8	1		Reserved	0xFF

Example Payload

1C 00 00 FF

2.2.3 Reboot Payload

This downlink command reboots the PlacePod.

Table 16: Reboot Payload Format

Type	Size	Field	Description	Value
uint8	1	data chan	data channel	0x3F
int16	2	data	data	0x0000
uint8	1		Reserved	0xFF

Example Payload

3F 00 00 FF

To contact PNI Customer Support, please visit: <https://www.pnicorp.com/support/>