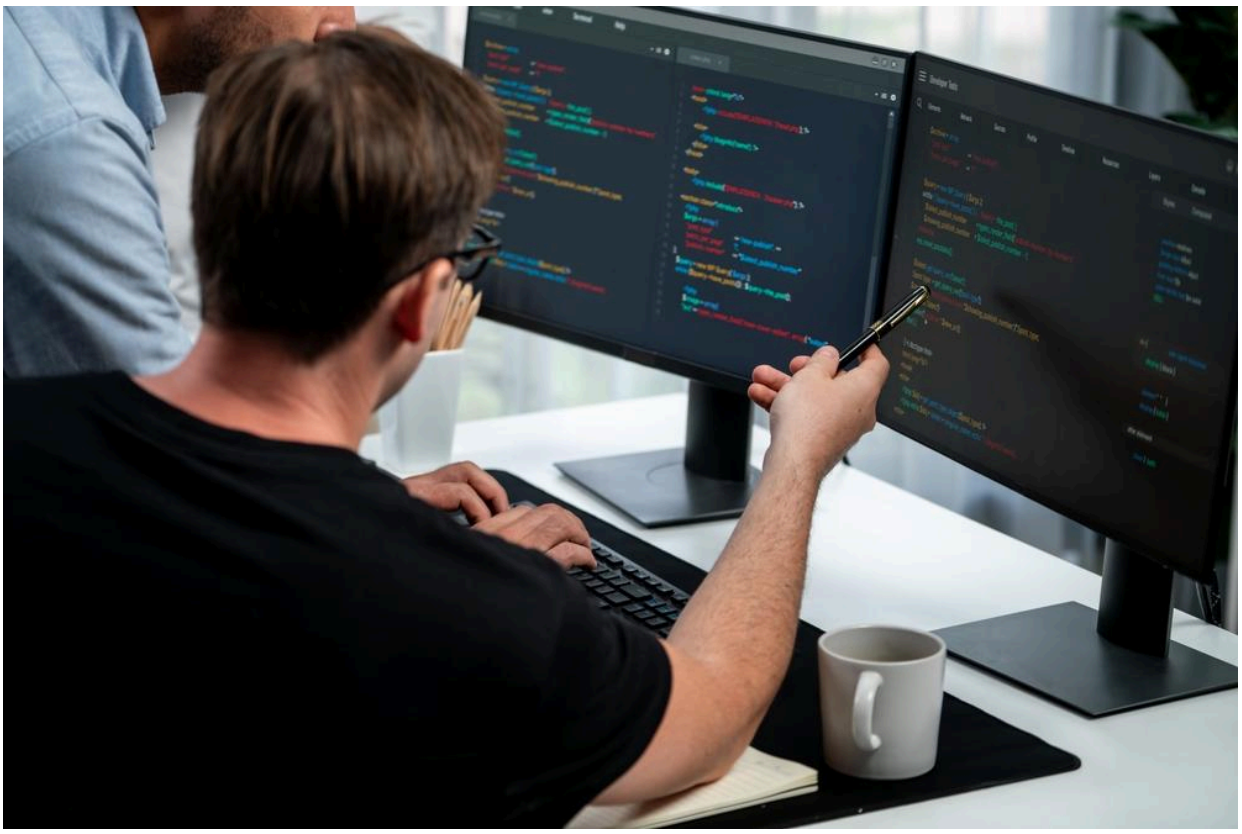
PMX TCR

LoRaWAN Payload Description

Rev. 04

This document provides technical specifications and provides technical information about LoRAWAN Payloads of TCR Traffic Counters.

It is intended for software engineers responsible for implementing payload decoders for TCR traffic counters.



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Device ID Uplink (Port 190)

The DeviceID payload contains device identification data and firmware version information. This can be useful in large installations to maintain a device inventory with information such as type and firmware version. If this is not needed, just ignore this payload.

After TCR has successfully joined a LoRaWAN® network, a DeviceID payload is sent once via **port 190**.

Payload Format

A Device ID Payload is 8 bytes long (16 hex characters) and contains the following data fields.

Byte #	0	1	2	3	4	5	6	7
Field	**HEAD**	**TYPE**	**FL**	**SC**	**PMX_FW**		**SBX_FW**	

Field	Data (Hex)	Description
HEAD	D2	Device ID Payload V2 (Header)
TYPE	00-0D	Device Type: 00 : TCR-LS 01 : TCR-LSS 02 : TCR-HS 03 : TCR-HSS 04 : TCR-LSA 05 : TCR-LSB 06 : TCR-HSA 07 : TCR-HSB 08 : TCR-LSBS 09 : TCR-HSBS 0A : TCR-DLI 0B : TCR-DLE 0C : TCR-SLI 0D : TCR-SLE
FL	00-02	Feature Level: 00: BASIC features (no licence installed) 01: ADVANCED Features 02: PRO Features
SC	00-02	Speed Class: 00 : P 01 : LS 02 : HS

PMX_FW	0000-FFFF	PMX Firmware Version 1203 ⇒ 1.2.3 120A ⇒ 1.2.10 1210 ⇒ 1.2.16
SBX_FW	0000-FFFF	SBX Solar Charger Firmware Version (returns 0000 if none installed) 4200 ⇒ 4.2.0 420A ⇒ 4.2.10 4210 ⇒ 4.2.16

Example

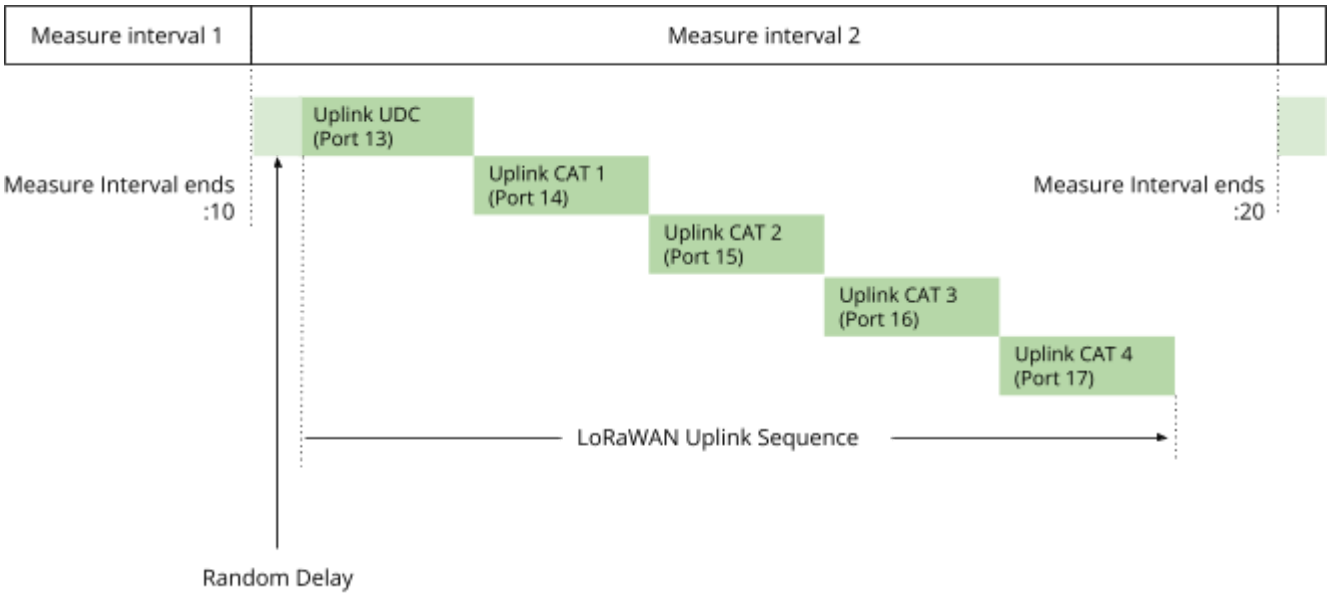
A Device ID payload of **D2 0A 02 02 11 00 42 00** in hexadecimal would include the following data:

D2 It's a **Device ID** payload **V2**
0A Device Type is **TCR-DLI**
02 **PRO** features enabled (licence is installed)
02 **Speed Class HS** (High Speed Traffic)
11 00 PMX Firmware Version **1.1.0**
42 00 SBX Firmware Version **4.2.0**

Counter Uplinks (Ports, 13,14,15,16,17)

While the data acquisition is synchronous, the LoRaWAN data communication is asynchronous with a random delay added after the measure interval. Thanks to the timestamp in the payload showing the exact time of the end of the interval, delays or repeated uplinks are not an issue and can be ignored.

Just use the UTC timestamp in the payload and not the time when the LoRaWAN server received the message.



TCR counters send an uplink for each enabled filter category. Additionally there is a counter for registering all detections without a filter.

If all *Filters Categories* and the *Unfiltered Detections Counter* are enabled, you will see 5 uplinks from the device sent in a sequence.

However, the payload format of the individual uplinks is identical, so that you only need to write one payload decoder for all counters. The port number can be used to differentiate between individual counters.

Uplinks	**Port used**
Unfiltered Detections Counter (UD)	**13**
Filter Category 1 Counter (CAT1)	**14**
Filter Category 2 Counter (CAT2)	**15**
Filter Category 3 Counter (CAT3)	**16**
Filter Category 4 Counter (CAT4)	**17**

To save airtime, the payload has been reduced to 10 bytes. This allows operation in all major LoRaWAN® regions such as EU868, AS923, AU915 at slow data rates.

By using different port numbers for each counter, the network server can easily identify the type of data that is being sent and route it to the appropriate application or service.

Payload Format

A Counter Payload is 10 bytes long (20 hex characters) and contains the following data fields.

Byte #	0	1	2	3	4	5	6	7	8	9
Field	**HEAD**	**TIME**		**LTR_CNT**		**LTR_SPD**	**RTL_CNT**		**RTL_SPD**	**VOLTS**

Field	Data (Hex)	Description
HEAD	A2	Counter Payload V2 (Header)
TIME	0000-1738	Measure Interval End Timestamp MMHH HH = Hours (00-24) MM= Minutes (00-59) HH MM 00 00 ⇒ 00:00 01 30 ⇒ 01:48 17 38 ⇒ 23:59 Time is synced from LNS after joining and every 24h. Timezone: UTC
LTR_CNT	0000-FFFF	Left-to-Right (LTR) Counter Value (0-65535)
LTR_SPD	00-FF	Left-to-Right (LTR) average speed of all objects counted in this interval [km/h] **Note: This is a pro feature.**
RTL_CNT	0000-FFFF	Right-to-Left (RTL) Counter Value (0-65535)
RTL_SPD	00-FF	Right-to-Left (RTL) average speed of all objects counted in this interval [km/h] **Note: This is a pro feature.**
VOLTS	00-42	Power supply voltage. Divide by 10 to get volts. 00-FF ⇒ 0.0-25.5V

Example

A counter payload of **A2 14 0A 03 E8 32 04 4C 34 32** in hexadecimal would include the following data:

A2 It's a counter payload V2
14 0A Measure interval ended at **20:10 UTC**
03 E8 LTR direction counted **1000 objects** in the last measure interval
32 The average speed of those 1000 objects was **50 km/h**
04 4C RTL direction counted **1100 objects** in the last measure interval
34 The average speed of those 1100 objects was **52 km/h**
32 The devices power supply voltage was **5.0V**

Configuration Downlink / Uplink (Port 1)

Once devices are deployed, physical access is typically restricted. If changes need to be made after deployment, it is possible to send LoRaWAN downlinks to the device to change some of the settings remotely.

This chapter lists all settings that can be read or changed remotely. For security reasons, settings that could affect the LoRaWAN connection cannot be changed.

All configuration downlinks are sent **to port 1** of the device and get answered **from port 1.**

Note: If settings are changed, the device will respond with an uplink that reflects the changed value. If the desired value is not possible, the value will be set to the next possible value . Some settings can only be changed if the Pro features have been activated with a licence key.

General Settings

These Downlinks are used to read or change general device settings.

	xxxx	Port	Description
C251		1	Read the current licence key
C251xxxx	byte[16]	1	Install a new licence key by appending the 16 bytes long key.
C252		1	Read the current feature level Returns: C2520000: BASIC features C2520001: ADVANCED features C2520002: PRO features
C253		1	Read the current speed class setting
C253xxxx	0000-0002	1	Change Speed Class of device 0000: P 0001: LS (ADVANCE or PRO licence required) 0002: HS (PRO licence required)
C254		1	Read the current interval setting
C254xxxx	0000-003C	1	Change the interval setting. Valid arguments include 2,3,4,5,6,10,12,15,30,60 min
C201		1	Check if the Unfiltered Detections Counter (UDC) is active
C201xxxx	0000-0001		Enable or disable Unfiltered Detections Counter (UDC) Append 0 to disable, 1 to enable the counter. Returns 0 when disabled, 1 when enabled.

C2DF		1	Set Device to Factory Defaults **Warning! This will overwrite all your changes**
C2EE		1	Restart device with the new settings

Category Filter Settings

Downlinks used to modify filter settings and enable/disable counters.

Note: When changing filter settings, the device will respond with an uplink that reflects the active value if the desired value is not possible. Number of available categories depends on the installed licence (Pro feature).

Payload Hex String	**n**	**xxxx**	**Port**	**Description**
C2[n]1	1-4	-	1	Check if a category filter is enabled. Returns 0 when disabled, 1 when enabled.
C2[n]1xxxx	1-4	0000-0001	1	Enable or disable a category filter. Append 0 to disable, 1 to enable the counter. Returns 0 when disabled, 1 when enabled.
C2[n]2	1-4	-	1	Returns the minimum object size of the filter in cm.
C2[n]2xxxx	1-4	0000-FFFF	1	Set the minimum size of an object that should be counted by this category. Returns the new value.
C2[n]3	1-4	-	1	Returns the maximum object size of the filter in cm.
C2[n]3xxxx	1-4	0000-FFFF	1	Set the maximum size of an object that should be counted by this category. Returns the new value.
C2[n]4	1-4	-	1	Returns the minimum speed of this category in km/h
C2[n]4xxxx	1-4	0000-FFFF	1	Set the minimum speed of an object to be counted in this category. Returns the new minspeed.
C2[n]5	1-4	-	1	Returns the maximum speed of this category in km/h
C2[n]5xxxx	1-4	0000-FFFF	1	Set the maximum speed of an object to be counted by this category. Returns the new maxspeed.
C2EE	-	-	1	Restart device with the new filter values

Radar Settings

Downlinks used to modify radar settings.

Payload Hex String	xxxx	Port	Description
C261	-	1	Check if radar sensor is enabled
C261xxxx	0000-0001	1	Enable radar sensor if it has been disabled before. Append 1 to enable, 0 to disable
C264	-	1	Check if AI Autosens is enabled. Returns 1 for enabled, otherwise 0
C264xxxx	0000-0001	1	Enabled/Disable AI Autosens by appending 1 for enabled or 0 for disabled. **Note: This feature is available with a PRO licence**
C263	-	1	Get the current sensitivity level from 0-100%
C263xxxx	0000-0064	1	Set the current sensitivity level from 0-100%
C262	-	1	Get the current radar channel setting.
C262xxxx	0000-FFFF	1	Set the device to another radar channel. Append 1 or 2. **Note: This feature is available with a PRO licence**
C2EE	-	1	Restart device with the new settings

LoRaWAN Settings

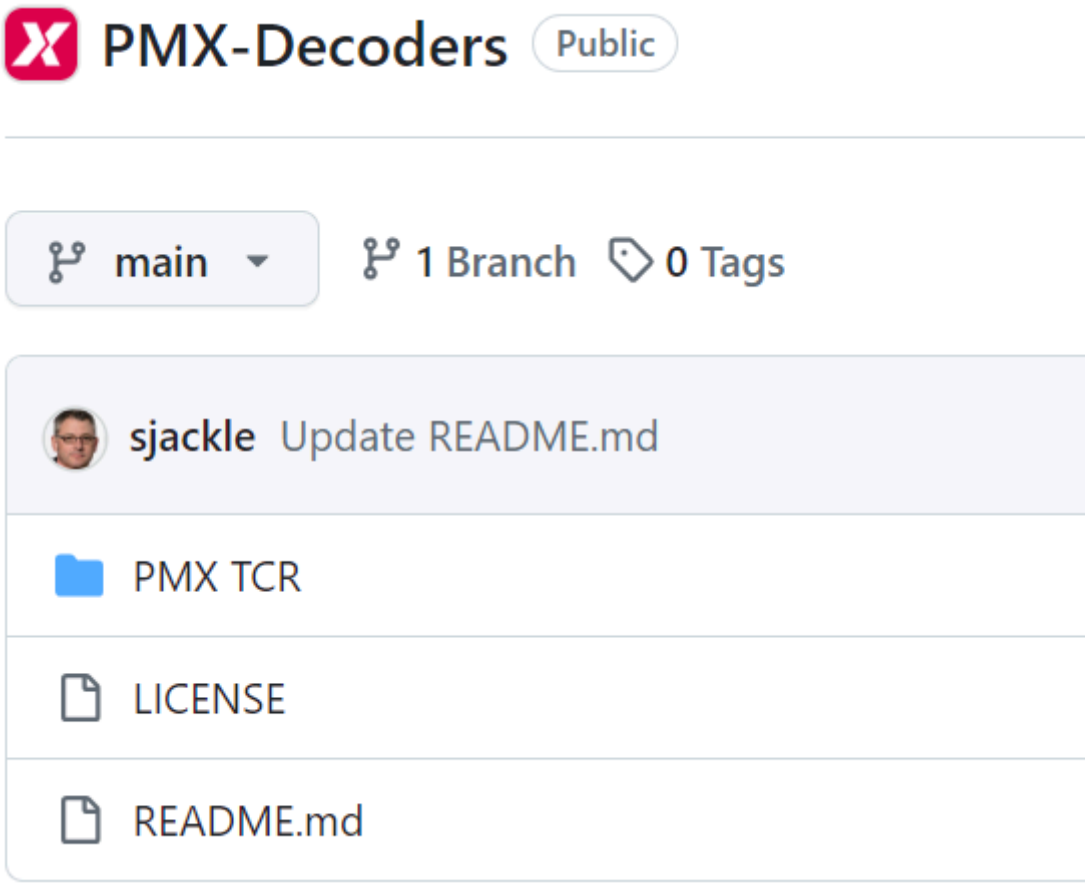
There is only one setting that can be changed when it comes to LoRaWAN connectivity.

Payload Hex String	xxxx	Port	Description
C271	-	1	Check if confirmed LoRaWAN uplinks are enabled
C271xxxx	0000-0001	1	Enable confirmed LoRaWAN uplinks Append 0001 for confirmed uplinks, 0000 for unconfirmed uplinks.
C2EE	-	1	Restart device with the new settings

Example Decoders

You can find example payload decoders on our public GitHub Repository.

https://github.com/pmx-systems/PMX-Decoders



Revisions

Revisions of this user manual

Revision	Date	Changes
00	2024-06-25	Initial release
01	2024-06-27	Added Link to GitHub Repository with example payload decoders
02	2024-07-17	Added more examples
03	2024-07-18	Changed description of counter to be more clear
04	2024-07-20	Added Unfiltered Detections Counter (UDC) downlink configuration C201

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