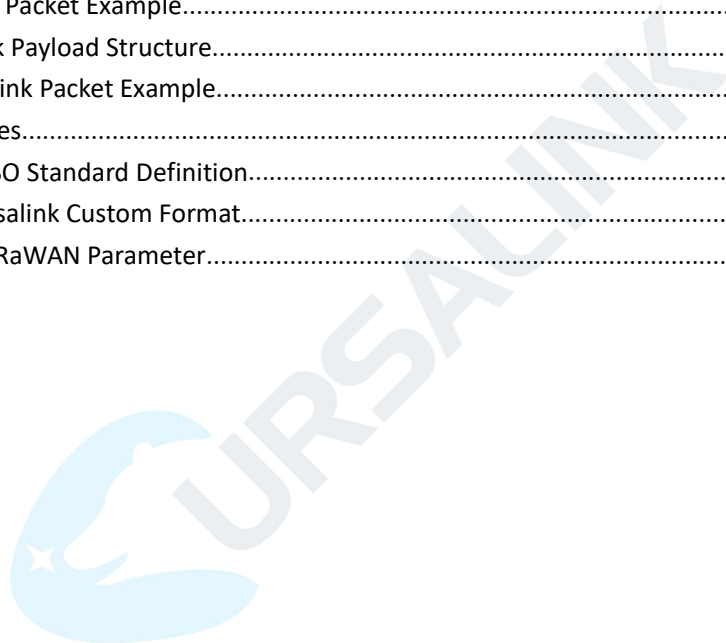


# AM100/AM102 Payload Structure

## V1.0

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## 1. Uplink Payload Structure

An uplink message can be sent from AM100/AM102 to gateway. Also, the AM100/AM102 sends different sensor data in different frames. In order to do that, all sensor data must be prefixed with two bytes:

**Data Channel:** Uniquely identifies each sensor in the AM100/AM102 across frames, e.g. "Temperature Sensor".

**Data Type:** Identifies the data type in the frame, e.g. "Battery Level".

The device can send multiple sensor data at a time by using the following payload structure:

1 Byte	1 Byte	N Bytes	1 Byte	1 Byte	M Bytes	1 Byte	...
Channel1	Type1	Data1	Channel2	Type2	Data2	Channel 3	...

Channel ID	Description
1	Battery
2	Reserved
3	Temperature Sensor
4	Humidity Sensor
5	PIR Sensor
6	Light Sensor
7	CO <sub>2</sub> Sensor
8	TVOC Sensor
9	Barometric Pressure Sensor

For message decoder please refer to <https://github.com/Ursalink-CN/ursalink-decoder>, where you find code examples.

### Uplink Packet Example

Frame N: Regular uplink (temperature, humidity, activity level (PIR), illumination, CO<sub>2</sub>, TVOC, barometric pressure)

03 67 fc 00		
Channel	Type	Value
03 (Temperature Sensor)	67 (Temperature)	fc 00 => 00 fc = 252 means 25.2°C

<b>04 68 49</b>		
Channel	Type	Value
04 (Humidity Sensor)	68 (Humidity)	49=>73 means 36.5%

<b>05 6a 36 00</b>		
Channel	Type	Value
05 (PIR Sensor)	6a (Activity Level)	36 00 => 00 36 = 54

<b>06 65 11 00 15 00 70 00</b>		
Channel	Type	Value
06 (Light Sensor)	65 (Illumination)	Illumination:11 00 => 00 11 = 17 lux Visible+Infrared: 15 00 => 00 15 = 21 Infrared: 70 00=> 00 70 => 112

<b>07 7d 19 02</b>		
Channel	Type	Value
07 (CO <sub>2</sub> Sensor)	7d (Concentration)	19 02 => 02 19 = 537 ppm

<b>08 7d 00 00</b>		
Channel	Type	Value
08 (TVOC Sensor)	7d (Concentration)	00 00 => 00 00 = 0 ppb

<b>09 73 01 04</b>		
Channel	Type	Value
09 (Barometric Pressure Sensor)	73 (Barometric Pressure)	01 04 => 04 01 = 1025 (102.5 kPa=102500 Pa)

Frame N+1: Battery level changes uplink.

01 75 5a		
Channel	Type	Value
01 (Battery)	75 (Battery Level)	5a = 90 means 90%

Frame N+2:

Contents reported after reboot each time: Ursalink Custom Format Version + SN + Hardware Version + Software Version + Class Type

ff 0b ff ff 01 01					
Channel	Type	Value	Channel	Type	Value
ff=255	0b = 11 (Device Restart Notification)	ff (Reserved)	ff=255	01 = 1 (Custom Format Version)	01 = 1 (Version =1)

ff 08 61 28 a1 03 57 95		
Channel	Type	Value
ff=255	08 = 8 (Device SN)	61 28 a1 03 57 95

ff 09 01 00 ff 0a 01 01					
Channel	Type	value	Channel	Type	Value
ff = 255	09 (Hardware Version)	0100 (V1.0)	ff = 255	0a (Software Version)	0101 (V1.1)

ff 0f 00		
Channel	Type	value
ff = 255	0f (Class Type)	00 (Class A)

## 2. Downlink Payload Structure

A downlink message can be sent from gateway to sensor in order to perform some actions on that device.

**Note:** the application port of AM100/AM102 is 85.

1 Byte	2 Bytes	1 Byte1	1 Byte	2 Bytes	1 Byte
Channel1	Data1	0xff (Reserved)	Channel2	Data2	0xff (Reserved)

### Downlink Packet Example

Frame N: Set the data reporting interval as 20 mins (1200s).

ff 03 b0 04		
Channel	Type	Value
ff = 255	03 (Set Reporting Interval)	b0 04 => 04 b0 = 1200 (second)

## 3. Data Types

### 3.1 IPSO Standard Definition

Data Types conform to the IPSO Alliance Smart Objects Guidelines, which identifies each data type with an "Object ID" . However, as shown below, a conversion is made to fit the Object ID into a single byte.

DATA\_TYPE = IPSO\_OBJECT\_ID - 3200

Type	IPSO	Hex	Data Size	Data Resolution per Bit
Temperature Sensor	3303	67	2	0.1°C Signed MSB
Humidity Sensor	3304	68	1	0.5% Unsigned
PIR Sensor	3306	6a	2	1
Illumination Sensor	3301	65	2	1 Lux Unsigned MSB
Concentration	3325	7d	2	1
Barometer	3315	73	2	0.1 hPa
Battery	3317	75	1%	1%

**Example:**

Devices with temperature and humidity sensors.

Frame N

<b>03 67 FF D7</b>		
Channel	Type	Value
03	67 means temperature	FFD7 = -41 means -4.1°C

Frame N+1

<b>04 68 73</b>		
Channel	Type	Value
04	68 means humidity	73 = 115 means 57.5%

**3.2 Ursalink Custom Format**

Type	Type ID	Data Size	Data Resolution (per bit)
Ursalink Custom Format Version	1	1	0x01
Data Collection Interval	2	2	1s
Data Reporting Interval	3	2	1s
LoRa Channel Mask	5	3	ID (1B) + Value (2B) ID: 1~6
Debug Level	7	1	Bit0: info Bit1: debug Bit2: warn Bit3: err
Device SN	8	6	641090824375 => 0x641090824375
Hardware Version	9	2	0110 => 0x01 0x10
Software Version	10	2	0110 => 0x01 0x10
Device Restart Notification	11	1	0xff reserved
Device Power Off Notification	12	1	0xff reserved
Class Type	15	1	00: Class A

### 3.3 LoRaWAN Parameter

<b>DevEUI</b>	24E124 + 2 <sup>nd</sup> to 11 <sup>th</sup> digits of SN e.g. SN = 61 26 a1 01 84 96 Then Device EUI = 24E124126a101849
<b>AppEUI</b>	24e124+c0002a0001
<b>Appport</b>	0x55
<b>NetID</b>	0x010203
<b>DevAddr</b>	The 5 <sup>th</sup> to 12 <sup>th</sup> digits of SN e.g. SN = 61 26 a1 01 84 96 Then DevAddr = a1018496
<b>AppKey</b>	5572404c696e6b4c6f52613230313823
<b>NwkSKey</b>	5572404c696e6b4c6f52613230313823
<b>AppSKey</b>	5572404c696e6b4c6f52613230313823

---End---

