Senstick Microclimate 2.3
LoRaWAN Protocol
FW v1.8

1. LoraWAN DATA Payload (Uplink)

Parameter:	stat	t	rh	ap	mov	bat	**SUM**
Size:	1B	2B	2B	1B	1B	1B	**8B**

Parameter	**Name**	**Range**	**Size**	**Type**	**Description**
Status	stat	0 - 255	1B	uint8	Status Codes: 0x00 - OK, Bit0 - Movement Detected, Bit1 - Accelerometer Failure, Bit2 - T/RH Sensor Failure, Bit3 - AP Sensor Failure, Bit4 - VOC Sensor Failure, Bit5 - NFC Failure, Bit6 - Reserved, Bit7 - Reserved
Temperature	t	-128.00 - 127.00	2B	int16	Temperature (t / 100)
Relative Humidity	rh	0.00 - 100.00%	2B	uint16	Relative Humidity (rh1 / 100)
Air Pressure	ap	845 - 1100 mbar	1B	uint8	Air Pressure (ap1 + 845)
Movement	mov	0 - 2.00G	1B	uint8	Acceleration on the max axis (mov / 100)
Battery Level	bat	1 - 3.55V	1B	uint8	Battery Level (bat / 100 + 1) (min. 2.2V)

NOTE: LoRaWAN Port 2 is used.

3. LoraWAN CONFIG Payload (Uplink)

Par	sendp	joinr	joinp1	joinp2	adren	dr	accen	tmpen	apen	vocen	accth	ackco	fwv	**S**
Size	2B	2B	2B	2B	1b	3b	1b	1b	1b	1b	1B	1B	1B	**11B**

Parameter	**Name**	**R/W**	**Size**	**Type**	**Default Value**	**Description**
Send Period	sendp	R/W	2B	uint16	900 sec	Send period in seconds.
Join Retries	joinr	R/W	2B	uint16	25	A number of Join retries after boot using Join Retry Period 1.
Join Retry Period 1	joinp1	R/W	2B	uint16	60 sec	First Join Retry Period after boot.
Join Retry Period 2	joinp2	R/W	2B	uint16	1800 sec	Second Join Retry Period after all Join Retries failed.
Enable ADR	adren	R/W	1b	bool	True	Enable Adaptive Data Rate. If False always use Data Rate settings.
Data Rate	dr	R/W	3b	uint3	0	Use only if Enable ADR is False. DR0 - DR7 (x = DRx).
Accelerometer Enabled	accen	R/W	1b	bool	True	Accelerometer enabled.
Temp/Humidity Enabled	tmpen	R/W	1b	bool	True	HDC2080 enabled.
Air Pressure Enabled	apen	R/W	1b	bool	True	DPS310 enabled.
VOC Enabled	vocen	R/W	1b	bool	False	BMP680 enabled.
Accelerometer Threshold (x, y, z)	accth	R/W	1B	uint8	10 % max value	If the accelerometer x, y or z-axis value is greater than the threshold value, wakeup system.
Packet Confirm	ackco	R/W	1B	uint8	4	Request confirmed packed every N transmissions. 0 == OFF.
Firmware Version	fwv	R	1B	uint8	1.8	Firmware Version (fwv / 10).

NOTE: LoRaWAN Port 2 is used.

4. LoRaWAN CONFIG Payload (Downlink) - Send Period

Param:	sendp	**SUM**
Size:	2B	**2B**

Parameter	**Name**	**R/W**	**Size**	**Type**	**Default Value**	**Description**
Send Period	sendp	R/W	2B	uint16	900 sec	Send period in seconds.

DEFAULT DOWNLINK PACKET: 0384

5. LoRaWAN CONFIG Payload (Downlink) - Reboot

Param:	rejoin	**SUM**
Size:	1B	**1B**

Parameter	**Name**	**R/W**	**Size**	**Type**	**Default Value**	**Description**
Rejoin	reboot	W	1B	uint8	1	Start REBOOT procedure.

DEFAULT DOWNLINK PACKET: 01

6. LoRaWAN CONFIG Payload (Downlink)

Param	sendp	joinr	joinp1	joinp2	adren	dr	accen	tmpen	apen	vocen	accth	ackco	**SUM**
Size:	2B	2B	2B	2B	1b	3b	1b	1b	1b	1b	1B	1B	**10B**

Parameter	**Name**	**R/W**	**Size**	**Type**	**Default Value**	**Description**
Send Period	sendp	R/W	2B	uint16	900 sec	Send period in seconds.
Join Retries	joinr	R/W	2B	uint16	25	A number of Join retries after boot using Join Retry Period 1.
Join Retry Period 1	joinp1	R/W	2B	uint16	60 sec	First Join Retry Period after boot.
Join Retry Period 2	joinp2	R/W	2B	uint16	1800 sec	Second Join Retry Period after all Join Retries failed.
Enable ADR	adren	R/W	1b	bool	True	Enable Adaptive Data Rate. If False always use Data Rate settings.
Data Rate	dr	R/W	3b	uint3	0	Use only if Enable ADR is False. DR0 - DR7 (x = DRx).
Accelerometer Enabled	accen	R/W	1b	bool	True	Accelerometer enabled.
Temp/Humidity Enabled	tmpen	R/W	1b	bool	True	HDC2080 enabled.
Air Pressure Enabled	apen	R/W	1b	bool	True	DPS310 enabled.
VOC Enabled	vocen	R/W	1b	bool	False	BMP680 enabled.
Accelerometer Threshold (x, y, z)	accth	R/W	1B	uint8	10 % max value	If accelerometer x, y or z-axis value is greater than the threshold value, wakeup system.
Packet Confirm	ackco	R/W	1B	uint8	4	Request confirmed packed every N transmissions. 0 == OFF.

DEFAULT DOWNLINK PACKET: 03840019003C07088E3204

PACKET GENERATOR

7. TTN Payload Decoder

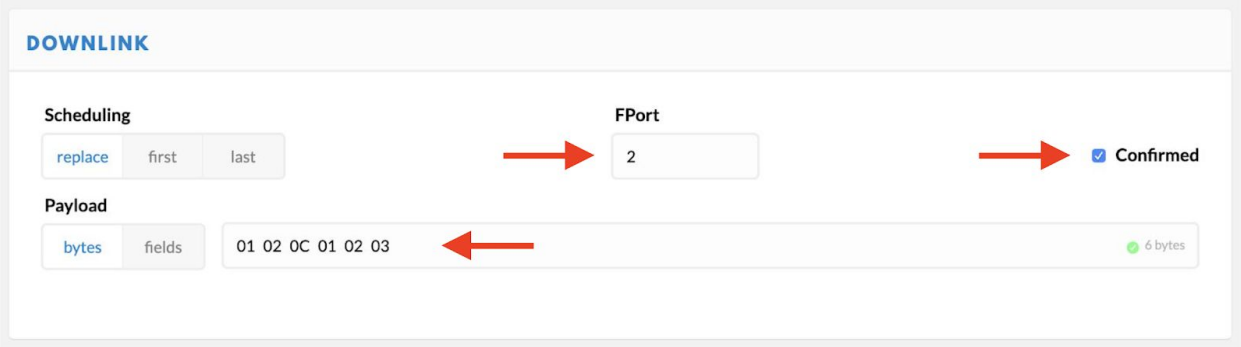
TTN PAYLOAD DECODER

```
/*
   _____                          __          _____                    __  _       __
  / ___/___  ____  _________  ____/ /___ ____ / ___/___  ____  _____/ /_(_)____/ /__
  \__ \/ _ \/ __ \/ ___/ _ \/ __  / __ `/ _ \\__ \/ _ \/ __ \/ ___/ __/ / ___/ //_/
 ___/ /  __/ / / (__  )  __/ /_/ / /_/ /  __/__/ /  __/ / / (__  ) /_/ / /__/ ,<
/____/\___/_/ /_/____/\___/\__,_/\__, /\___/____/\___/_/ /_/____/\__/_/\___/_/|_|
                                /____/
*/


function Decoder(bytes) {

  // If Config Packet
  if (bytes.length == 10) {

      var SendPeriod = (bytes[0] << 8) + bytes[1];
      var JoinRetries = (bytes[2] << 8) + bytes[3];
      var JoinRetryPeriod1 = (bytes[4] << 8) + bytes[5];
      var JoinRetryPeriod2 = (bytes[6] << 8) + bytes[7];
      var EnableADR = bytes[8] >> 7;
      var DataRate = (bytes[8] >> 4) - 8*EnableADR;
      var AccEnabled = (bytes[8] >> 3) - 16*EnableADR - 2*DataRate;
      var TempHumidityEnabled = (bytes[8] >> 2) - 32*EnableADR - 4*DataRate - 2*AccEnabled;
      var AirPressureEnabled = (bytes[8] >> 1) - 64*EnableADR - 8*DataRate - 4*AccEnabled -
2*TempHumidityEnabled;
      var VOCEnabled = bytes[8] - 128*EnableADR - 16*DataRate - 8*AccEnabled -
4*TempHumidityEnabled - 2*AirPressureEnabled;
      var AccThreshold = bytes[9];


    return {
      SendPeriod: SendPeriod,
      JoinRetries: JoinRetries,
      JoinRetryPeriod1: JoinRetryPeriod1,
      JoinRetryPeriod2: JoinRetryPeriod2,
      EnableADR: EnableADR,
      DataRate: DataRate,
      AccEnabled: AccEnabled,
      TempHumidityEnabled: TempHumidityEnabled,
      AirPressureEnabled: AirPressureEnabled,
      VOCEnabled: VOCEnabled,
      AccThreshold: AccThreshold

    };

  }
  // Config FW Version 1.8+
  else if (bytes.length == 12) {
```

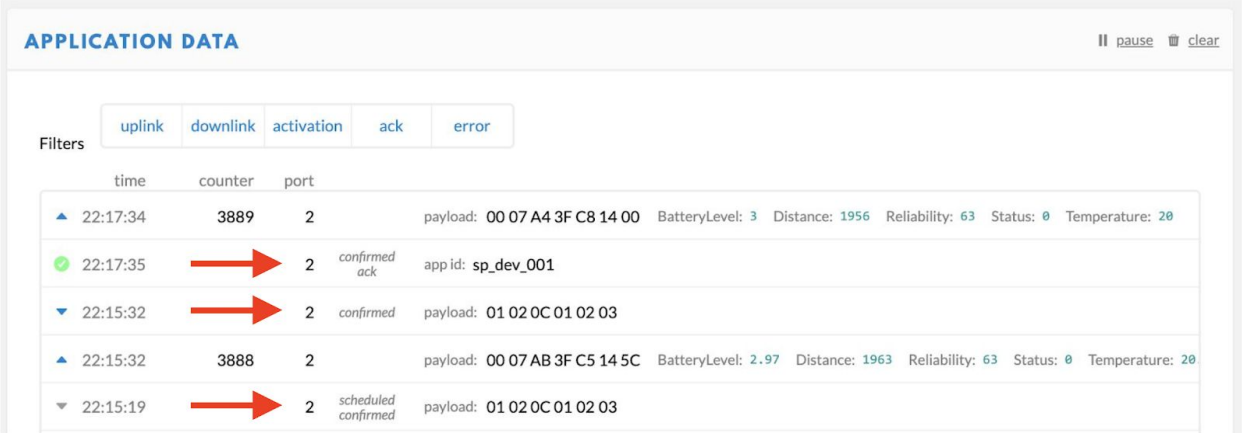
```
      var SendPeriod = (bytes[0] << 8) + bytes[1];
      var JoinRetries = (bytes[2] << 8) + bytes[3];
      var JoinRetryPeriod1 = (bytes[4] << 8) + bytes[5];
      var JoinRetryPeriod2 = (bytes[6] << 8) + bytes[7];
      var EnableADR = bytes[8] >> 7;
      var DataRate = (bytes[8] >> 4) - 8*EnableADR;
      var AccEnabled = (bytes[8] >> 3) - 16*EnableADR - 2*DataRate;
      var TempHumidityEnabled = (bytes[8] >> 2) - 32*EnableADR - 4*DataRate - 2*AccEnabled;
      var AirPressureEnabled = (bytes[8] >> 1) - 64*EnableADR - 8*DataRate - 4*AccEnabled -
2*TempHumidityEnabled;
      var VOCEnabled = bytes[8] - 128*EnableADR - 16*DataRate - 8*AccEnabled -
4*TempHumidityEnabled - 2*AirPressureEnabled;
      var AccThreshold = bytes[9];
      var PacketConformation = bytes[10];
      var FirmwareVersion = bytes[11]/10;

    return {
      SendPeriod: SendPeriod,
      JoinRetries: JoinRetries,
      JoinRetryPeriod1: JoinRetryPeriod1,
      JoinRetryPeriod2: JoinRetryPeriod2,
      EnableADR: EnableADR,
      DataRate: DataRate,
      AccEnabled: AccEnabled,
      TempHumidityEnabled: TempHumidityEnabled,
      AirPressureEnabled: AirPressureEnabled,
      VOCEnabled: VOCEnabled,
      AccThreshold: AccThreshold,
      PacketConformation: PacketConformation,
      FirmwareVersion: FirmwareVersion

    };
  }
  // If Data Packet
  else {

    // If Reduced Data Packet Format
    if (bytes.length == 8) {

      var S = bytes[0];
      var T = (bytes[1] << 8) + bytes[2];
      var H = (bytes[3] << 8) + bytes[4];
      var AP1 = bytes[5];
      var MOV = bytes[6];
      var BAT = bytes[7];

      if (AP1 != 0) AP1 = AP1 + 845;

      return {
        Status: S,
        Temperature: sintToDec(T),
        Humidity: H / 100.0,
        AirPressure: AP1,
        Movement: MOV / 100,
        BatteryLevel: (BAT + 100) / 100
      };
```

```
    }
    else {

      var S = bytes[0];
      var T = (bytes[1] << 8) + bytes[2];
      var H1 = (bytes[3] << 8) + bytes[4];
      var AP1 = bytes[5];
      var VOC = (bytes[6] << 8) + bytes[7];
      var H2 = (bytes[8] << 8) + bytes[9];
      var AP2 = bytes[10];
      var MOV = bytes[11];
      var BAT = bytes[12];

      if (AP1 != 0) AP1 = AP1 + 845;
      if (AP2 != 0) AP2 = AP2 + 845;

      return {
        Status: S,
        Temperature: sintToDec(T),
        Humidity: H1 / 100.0,
        AirPressure: AP1,
        VOC: VOC * 135,
        Humidity2: H2 / 100.0,
        AirPressure2: AP2,
        Movement: MOV / 100,
        BatteryLevel: (BAT + 100) / 100
      };

    }

  }
}

function sintToDec(T){
  if (T > 32767) {
    return ((T - 65536) / 100.0);
  }
  else {
    return (T / 100.0);
  }
}
```

8. TTN Downlink Guide



Application > Device > Overview > Downlink



Application > Device > Data