SmartOne C Version 2.4.x (Aviation)

SmartOne C
FW - Version 2.4.x
Aviation 18 bytes

Short Technical Reference

Preliminary

2017-06-15

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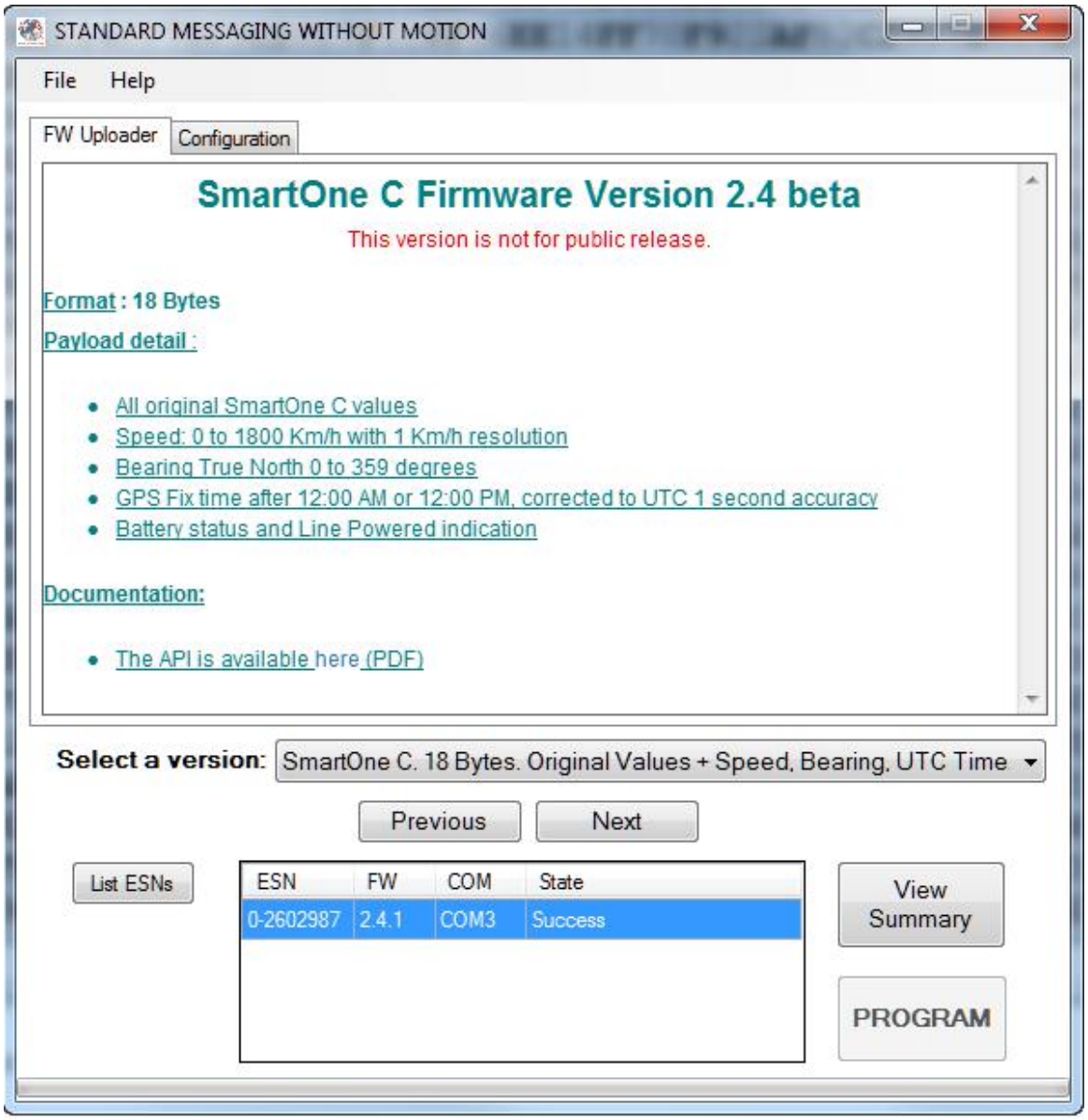
Modified Multiple Uploader

This version of the SmartOne C Firmware Updater gives access to the the most recent SmartOne C firmware versions available from the AtlasTrax servers. New versions aill be automatically listed and available to users via the drop-down selector. A splash screen summarizes the main features of the selected version.



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Payload structure

Multi Uploader Screenshot SmartOne C - FW 2.4.x			
18 bytes Payload Bytes 0 to 8 are similar to the standard 9 bytes regular payload			
Byte #	**Variable**	**Bit(s)**	**Description**
0	Type Field	2	**Bit (1:0) message type:** 0: Extended 18 bytes message 1:Truncated message type 3: Non standard message type
0	Battery State (Legacy for backward compatibility)	1	**Bit (2)** 0 = Good battery. 1 = Replace battery.
0	GPS Data Valid	1	**Bit (3)** 0 = GPS Data valid in this message. 1 = GPS failed in this message cycle, ignore Latitude and Longitude fields.
0	Missed Input State Change	2	**Bit (4) Missed Input 1.** A value of 1 in this bit means that an input state change of input 1 was missed due to the transmission of a higher priority message. **Bit (5) = Missed Input 2.** A value of 1 in this bit means that an input state change of Input 2 was missed due to the transmission of a higher priority message.
0	GPS Fail Counter	2	**Bit (7:6)** = GPS fail counter. Counts up to a maximum value of 3 upon GPS failure.
1 - 3 4 -6	Latitude /Longitude	48	Byte 1 = Latitude MSByte Byte 2 = Latitude Byte 3 = Latitude LSByte Byte 4 = Longitude MSByte Byte 5 = Longitude Byte 6 = Longitude LSByte 360 degrees of Longitude coded in signed binary with 3 bytes and 180 degrees of Latitude coded in signed binary with 3 bytes. Positive Longitudes correspond to East Longitudes Positive Latitudes correspond to North Latitudes

7	Input Status	4	These bits reflect the state of the inputs and indicate which one, if any, triggered an Input Status Changed message. **Bit 0: Input 1 change**: 0 = Did not trigger message, 1 = Triggered message. **Bit 1: Input 1 state**: 0 = Closed, 1 = Open **Bit 2: Input 2 change**: 0 = Did not trigger message, 1 = Triggered message **Bit 3: Input 2 state**: 0 = Closed, 1 = Open
7	Message Sub-Type	4	**Bits (7:4)** Message sub-type code. See sub-types below: Value is **0** in the location message. Value is **1** in the Device Turned On message. Value is **2** in the Change of Location Area alert message. Value is **3** in the Input Status Changed message. Value is **4** in the undesired input state message. Value is **5** in the re-centering message.
8	RESERVED	3	**Bits (2:0)** RESERVED in SmartOne
8	Vibration Triggered Message	1	**Bit (3)** Value 1 = This message is being sent because transmit on change of vibration state is selected and the vibration just changed state, or Undesired Vibration state is selected and the vibration is in the undesired state. Value 0 = This message is being transmitted for a reason other than the above reasons.
8	Vibration Bit	1	**Bit (4)** Value 1 = Unit is in a state of vibration. Value 0 = Unit is n in a state of vibration.
8	2D	1	**Bit (5)** Value 1 = GPS data reported is from a 2D fix. (Only 3 satellites were used in the fix.) Value 0 = GPS data reporte is from a 3D fix.
8	Motion	1	**Bit (6)** Value 1 = Device was In-Motion when the message was transmitted. Value 0 = Device was At-Rest when the messa was transmitted.
8	Fix Confidence Bit	1	**Bit (7)** 0=High confidence in GPS fix accuracy, 1=Reduced confidence in GPS fix accuracy.

Extended payload (Bytes 9 to 17)

9-10	Altitude in meters above mean sea level	16	**Byte 1: MSB** **Byte 2: LSB**	-413.9m to 17999.9m
11-13	Speed Over Gound & Bearing true north	24	**Bits 00-11** **Bits 12-23**	Speed 0 - 1800km/h Bearing 0 to 359° N
14-15	GPS Time of Day In seconds after 12AM or 12PM	16	**Byte 1: MSB** **Byte 2: LSB**	00:00:00 to 11:59:59 PM or AM
16	Battery State & Line Power	2	**Bit [0]** **Bit [1]**	0 = Good battery. 1 = Replace battery. 0 = Battery Powered 1 = Line Powered
16-17	Reserved for future use	14	**Bits[2-15]**	Always 0xDF

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Time Encoding / Decoding

Time encoding:

The GPS Time Of Day (GPS_{TOD}) represents the number of seconds elapsed since midnight or since noon with a maximum of 43199 (11:59:59).

Time decoding

1) Store GPS_{TOD} in a variable gps_time.
2) Calculate the Gateway timestamp from the UnixTime value.
3) Store the Date part (yyy-mm-dd) in a variable gw_date
4) Store the time part (HH:MM.ss) in a variable gw_time
5) $GPS_{dateTime}$= gw_date + gw_time.
6) If gps_time > gw_time remove 1 days from $GPS_{dateTime}$.

Notice that $GPS_{dateTime}$ differs form the UTC time by a value known as GPS leap second (LS). So, in order to obtain an accurate UTC time of acquisition, LS must be added to the GPS time. [UTC = $GPS_{DateTime}$+ LS]

C# code example:

```
DateTime decode_time(
    long gps_time,     // The value sent by the device
    long unixtime)     / / The gateway timestamp in UNIX format
{
    // Convert the UNIX timestamp into seconds of the day
    DateTime unix_time = new DateTime(1970, 1, 1).AddSeconds(unixtime);
    DateTime gw_date = new DateTime(utc_time.Year, utc_time.Month, utc_time.Day);

    long gw_time = unix_time.Hour * 3600 + unix_time.Minute * 60 + unix_time.Second;

    // calculate the GPS time seconds of the day
    long gps_time += LEAP_SECONDS;

    DateTime utc_dateTime = gw_date.AddSeconds(gps_time)

    if ( gps_time > gw_time )
    {
        utc_dateTime.AddDays (-1);
    }

    return utc_dateTime;
}
```

Note on leap second:

The GPS leap second value is not a constant so decoding applications must eventually adjust it. Since 2015-07-01 this value is -17 seconds. The next adjustment is scheduled on December 2016. The GPS Leap Second will be positive so the cumulative value will be 18 seconds (GPS - UTC=18 seconds).

More readings on this topic

here: http://tycho.usno.navy.mil/leapsec.html
and
here http://maia.usno.navy.mil/

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