ALTI2 Data Structure Definition

ALTI2 sends data through serial port at standard speed 19200Bd, 8N1 format. It can be received by any standard terminal software. Data are send in ASCII format, not binary. So for example byte “255” is send as 3 bytes “2”, “5” and “5”. It enables to save received data as text file and also it enables easy post processing. You can simply start terminal, save file and play with it.

Altitude measurement in ALTI2 is based on measurement of the atmospheric pressure. Analog to digital converter sends digital value of the pressure to the microcontroller. Data are processed and then are stored as difference between current and previous measurement. The legth of one measurement is one byte. Some bytes are reserved for blocks separation and transmition start/stop labels. Reference pressure (zero altitude) and storage period are stored for each block.

Transmittion starts with 126 byte. There is short header (X bytes) at the beginning which you don’t need for your calculations. Each block starts with 127 byte. It is followed by 2 bytes for reference pressure. It is unsigned int, so you need to calculate reference pressure by:

REFERENCE_PRESSURE_DIGITAL = (256 * Byte_hi) + Byte_lo (1)

The third byte is storage period in tenths of second. So if you receive 3, you have storage period 0.3 sec. You need this value for making X-axis in your chart. Next byte is first measured value. As I mentioned in the beginning, ALTI2 stores only difference in unsigned signed char format. Universal formula for getting the difference in signed form is:
IF(Byte >127) THEN Difference= 256-Byte ELSE Difference= -Byte (2)

For example if you receive 255 then Difference is 1, if you receive 1, the difference is -1. Now you need to add this difference to previous pressure. For first value it is reference pressure.

ACTUAL_PRESSURE_DIGITAL = REFERENCE_PRESSURE_DIGITAL + Difference (3)

Remaining values:

ACTUAL_PRESSURE_DIGITAL = PREVIOUS_ACTUAL_PRESSURE_DIGITAL + Difference (3)

Now you got digital value as was read by the converter. You need to recalculate it to real pressure readings (in kPa):

PRESSURE = 10.555555 - (PRESSURE_DIGITAL/147.456) (4)

You need to apply this formula for both reference pressure and actual pressure. Then you will finaly be able to recalculate real altitude:

ALTITUDE=LN(ACTUAL_PRESSURE/REFERENCE_PRESSURE)*(-29.153)*293 (5)

An example in original Excel macro would help you, too. Here is simplified flow chart of what your software should do.

Set serial port to 19200Bd, 8N1
|
Wait for start character “126”
|
Read complete data stream. It is finished by “128” character.
|
Separate all blocks. Block separator is “127”
|
For each block pickup reference pressure – digital. Formula (1).
|
Restore actual pressure (digital) from differetial values. Formulas (2) and (3)
|
Recalculate digital pressures (both actual and reference) to real analogue values. (4)
|
Calculate real altitude using (5). It is value on Y-axis.
|
Calculate time at X-axis using read period for each block
|
Create chart