**Data formats in the Cloud Height Ceilometer CT25K PC**

Data is stored in the folder /home/data/ceilo

There are three data sets:

The first is the data message No. 2, which Vaisala CT25K is sending all the time and received by PC via RS232 connection. The programme GrabCeilo.py stores these messages and produces daily files. See the data format in the Vaisala CT25K manual Message 2 on p. 48

The data file name has a format tiksi\_ceilo\_2012-09-06.dat

The second data files are produced by programme ceil2nc, which produces NetCDF type files <http://en.wikipedia.org/wiki/Netcdf>

These are height-backscatter files in numeric form.

The data file name has a format 20120906\_tiksi\_ct25k.nc

The third file type is the same information in graphical form which is in files 20120906\_tiksi\_ct25k.png

These graphical files are plotted on the PC display.

**Data Message No. 2**

Data message no. 2 contains the range and sensitivity normalized

backscatter profile within a range of 0 ... 25000 ft, which makes it

suitable for e.g. graphical plotting of the atmosphere.

Data resolution is 100ft = 30 m with distance, and 16 bits (four hex-

ASCII characters) with signal magnitude.

\_CTA2023\_ 1st line 11 char.

30 01230 12340 23450 FEDCBA98↵2nd line 31 char.

100 N 53 +34 204 146 +2 621 LF7HN1 139↵3rd line 44 char.

00047F200000000000000000000000000000000000000050D010000000000000000↵

01600FFFFFFFFFFFFFFFFFFFFFFFFFFFFFEFEFEFEFEFEFEFEFEFEFEFDFDFDFDFDFD↵

03200FFFFFFFFFFFFFFFFFFFFFFFFFFFFFEFEFEFEFEFEFEFEFEFEFEFDFDFDFDFDFD↵

048FDFDFDFDFDFCFCFCFCFCFCFCFCFBFBFBFBFBFBFBFAFBFAFBFBFAFAFBFAF9FAF9↵

064FDFDFDFDFDFCFCFCFCFCFCFCFCFBFBFBFBFBFBFBFAFBFAFBFBFAFAFBFAF9FAF9↵

080F9FAF9F9F9F9F9F9F9F8F7F8F7F9F8F7F7F8F6F7F7F7F6F6F7F6F7F6F6F6F6F6↵

096F9FAF9F9F9F9F9F9F9F8F7F8F7F9F8F7F7F8F6F7F7F7F6F6F7F6F7F6F6F6F6F6↵

112F5F5F5F6F5F2F4F5F6F5F5F4F4F4F4F3F4F3F4F5F3F5F4F4F2F3F3F3F3F4F4F3↵

128F5F5F5F6F5F2F4F5F6F5F5F4F4F4F4F3F4F3F4F5F3F5F4F4F2F3F3F3F3F4F4F3↵

144F2F2EFF1F4F1F2F2F1F3F2F2EFF1EFF0F0EFF1EFF0F1EFF0F0F2F0EFF0EFEFF0↵

160F2F2EFF1F4F1F2F2F1F3F2F2EFF1EFF0F0EFF1EFF0F1EFF0F0F2F0EFF0EFEFF0↵

176EEF1EFEDEFEEEFEEEEF0EDF0F2EFEDEFEFEFF0EFECECECEEEAF0EDEDECEAEAEA↵

192EEF1EFEDEFEEEFEEEEF0EDF0F2EFEDEFEFEFF0EFECECECEEEAF0EDEDECEAEAEA↵

208EEF1EFEDEFEEEFEEEEF0EDF0F2EFEDEFEFEFF0EFECECECEEEAF0EDEDECEAEAEA↵

224F0ECEFEDF0ECEBEEEDEEE9EAEFF0EEECEAEDECEBEAEEE7EDEAEAEAEBECEAEAEA↵

240F0ECEFEDF0ECEBEEEDEEE9EAEFF0EEECEAEDECEBEAEEE7ED0000000000000000↵

\_↵

4...19 line:

16 \* 69 = 1104 char.

12th line 3 char.

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total 1193 char.

Transmission time and size :

5.0 s at 2400 baud (10-bit char.)

143 kbytes/h, 3.44 Mbytes/d, 103 Mbytes/mo. at 2 msg./min.,

uncompressed.

Interpretation of the message is as follows:

**1ST LINE**

Identical to that of message no. 1 except that the two last digits

identifying the message are always 23.

**2ND LINE**

Identical to that of message no. 1

**3RD LINE**

Example: 100 N 53 +34 204 146 +2 621 LF7HN1 139↵

Measurement parameters are mostly in engineering units. Plus and

minus signs are possible. Out-of-Range is indicated by slashes (/////).

Contents:

100 Parameter SCALE, 100 (%) is normal (0...999 possible).

N Measurement mode; N = Normal, (C = Close range, not

available in CT25K).

53 Laser pulse energy, % of nominal factory setting (0 ... 999).

+34 Laser temperature degrees C (-50 ... ***+***99).

204 receiver sensitivity, % of nominal factory setting (0...999).

146 Window contamination, millivolts at internal ADC input

(0...2500).

+2 Tilt angle, degrees from vertical (-15 ... +90).

621 background light, millivolts at internal ADC input (0 ... 2500).

LF7HN1 Measurement parameters (pulse **L**ong/**S**hort, freq **F** (const.),

pulse qty 4**7**+1, gain **H**igh/**L**ow, bandwidth **N**arrow/**W**ide,

sampling **1**0/**2**0 MHz).

139 SUM of detected and normalized backscatter, 0 ... 999.

Multiplied by scaling factor times 104. At scaling factor 100

the SUM range 0 ... 999 corresponds to integrated backscatter

0...0.0999 srad-1.

**4TH...19TH LINE**

Backscatter profile, sensitivity and range normalized, at 100 ft = 30 m

resolution, normally scaled to units of (10000·srad·km)-1.

Example of 8th line:

064FDFDFDFDFDFCFCFCFCFCFCFCFCFBFBFBFBFBFBFBFAFBFAFBFBFAFAFBFAF9FAF9↵

where

064 = Is start distance (height) of line backscatter data

items; decimal, unit is 100ft = 30m = 200ns (twoway).

FDFC, FBFA, ... = Are 16 four-character data items per line,

at 100ft = 30m = 200ns resolution;

16-bit HEX-ASCII; msb nibble and bit first. 2's

complement. Data is range and sensitivity

normalized backscatter, units (10000·srad·km)-1

unless otherwise scaled by parameter SCALE.

**20TH LINE**

\_↵End-of-Text and CRLF.

**Data Message No. 1**

This message is intended for cloud height/vertical visibility

measurement when no other measurement information is desired. The

message includes the most elementary status information, which

enables a host system or operator to see that no warnings or alarms are

present. An example of data message no.1 is presented below:

\_CTA2010\_↵1st line 11 char.

30 01230 12340 23450 FEDCBA98↵2nd line 31 char.

\_↵3rd line 3 char.

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total 44 characters

Transmission time and size :

0.18 s at 2400 baud (10-bit char.)

10.6 kbytes/h, 253 kbytes/d, 7.6 Mbytes/mo. at 4 msg./min.,

uncompressed.

Interpretation of the message is as follows :

**1ST LINE**

Example: \_CTA2010\_↵

where

\_ = Start-of-Heading character

CT = Ceilometers' identification string; always CT

A = Unit number 0...9, A...Z

20 = Software level id 00...99

1 = Message number; this message is always = 1

0 = Spare character for future subclasses of message

\_ = Start-of-Text Character

**2ND LINE**

Example: 30 01230 12340 23450 FEDCBA98↵

where

3 = First digit of line:

01234

5

/

Detection status as follows:

No significant backscatter

One cloud base detected

Two cloud bases detected

Three cloud bases detected

Full obscuration determined but no cloud base

detected

Some obscuration detected but determined to be

transparent

Raw data input to algorithm missing or suspect

0 = Second digit of line:

0

WA

Warnings and Alarm information as follows:

Self-check OK

At least one Warning active, no Alarms

At least one Alarm active

01230 = If detection status is 1, 2 or 3:

If detection status is 4:

If detection status is 0 or 5:

Lowest cloud base height

Vertical Visibility as calculated

/////

12340 = If detection status is 2 or 3:

If detection status is 4:

If detection status is 0, 1 or 5:

Second lowest cloud base height

Highest signal detected

/////

23450 = If detection status is 3:

If detection status is 0, 1, 2, 4, 5:

Highest cloud base height

/////

FEDC

BA98

= Alarm (A), Warning (W), and internal status information. Each character is a

hexadecimal representation of four bits, i.e. values between 0 and 9 are presented

with respective numbers and values 10, 11, 12, 13, 14, and 15 are presented with

letters A, B, C, D, E, and F, respectively. As each character represents the sum of

four individual bits, the total number of bits is 32 (b00-b31), with the following breakdown and interpretation:

F: b31 (8000 0000) Laser temperature shut-off (A)

b30 (4000 0000) Laser failure (A)

b29 (2000 0000) Receiver failure (A)

b28 (1000 0000) Voltage failure (A)

E: b27 (0800 0000) (spare) (A)

b26 (0400 0000) (spare) (A)

b25 (0200 0000) (spare) (A)

b24 (0100 0000) (spare) (A)

D: b23 (0080 0000) Window contaminated (W)

b22 (0040 0000) Battery low (W)

b21 (0020 0000) Laser power low (W)

b20 (0010 0000) Laser temperature high or low (W)

C: b19 (0008 0000) Internal temperature high or low (W)

b18 (0004 0000) Voltage high or low (W)

b17 (0002 0000) Relative Humidity is > 85 % (option) (W)

b16 (0001 0000) Receiver optical cross-talk compensation poor (W)

B: b15 (0000 8000) Blower suspect

b14 (0000 4000) (spare) (W)

b13 (0000 2000) (spare) (W)

b12 (0000 1000) (spare) (W)

A: b11 (0000 0800) Blower is ON

b10 (0000 0400) Blower heater is ON

b09 (0000 0200) Internal heater is ON

b08 (0000 0100) Units are METERS if ON, else FEET

9: b07 (0000 0080) Polling mode is ON

b06 (0000 0040) Working from battery

b05 (0000 0020) Single sequence mode is ON

b04 (0000 0010) Manual settings are effective

8: b03 (0000 0008) Tilt angle is > 45 degrees

b02 (0000 0004) High background radiance

b01 (0000 0002) Manual blower control

b00 (0000 0001) (spare)

For example, if the window is contaminated, the battery voltage is too

low, the internal heater is on and units are meters, a warning is given

and the second line appears as

0W ///// ///// ///// 00C00300