

The Config File: contence, structure and example

Key words /parameters of config file:

General:

(DATA-Cube³ and DATA-Cube¹)

```
E_NAME=      Experiment Name
S_RATE=      Samplerate
F_TIME=      Flush SD time und GPS cycletime [min]
GPS_TI=      GPS on-time [min]
GPS_OF=      GPS off after / 0=GPS_TI 1=60 valid GPS strings
A_FILT=      Digital Filter 0=HPFoff 1=HPFon
A_PHAS=      Filter characteristics 0=LinPhase 1=MinPhase
GPS_ON=      GPS Option 0=cycled 1=continuously
PLL_XO=      OszillatorKorrektur / 1=PLL 2=DIFF
GPS_PO=      if set, then initial position
P_AMPL=      factor of amplification (P_AMPL * RefVolt/24bit) (from Config File)
C_MODE=      ADC Mode 0=LowPwr 1=High Res(from Config File)
A_CHOP=      Amplifier Chopping / 0=off 1=on (from Config File)
CH_NUM=      number of active channels(from Config File)
```

Service DATA-CUBE³ and DATA-CUBE¹

```
DEV_NO=      No of device (fix)(settable by extended Config File)V_TCXO= control voltage
TCXO (fix) (settable by extended Config File)P_GPSI= GPS TOOL / 1->displ Mgs 2->
Set TM+PV 3-> Set TM+PV4->compl. Init ACQ_ON=      Start Acquisition / 0=on valid
GPS 1=immediately S_DATE=Date set YY/MM/DDSDS_TIME= Time set HH:MM:SS
```

Pre-installed default :values

Following default values are used if there is no config file or it exists but the parameters are not specified elseor are improper:

General DATA-CUBE³ and DATA-CUBE¹

```
E_NAME="N/A" Experiment Name
S_RATE=100 Samplerate
F_TIME=30 Flush SD time and GPS cycletime [min]
GPS_TI=5 GPS switch-on time [min]
GPS_OF=0 GPS off after / 0=GPS_TI
A_FILT=0 Digital Filter 0=HPFoff
A_PHAS=0 Filter Characteristic 0=lin. phase
GPS_ON=0 GPS Option 0=cycled
PLL_XO=0 correction of oscillator / 0=off
P_AMPL=16 gain
C_MODE=0 ADC Mode / 0=LowPwr
A_CHOP=1 Amplifier Chopping / 1=on
CH_NUM=3 No of active Channels (applicable for DATA-CUBE3 only)
```

If the Config file is deleted a standard file (containing the default values) will be created while the DATA-CUBE is started (see Config file example).

Detailed explanation of the key words

[E_NAME] - *Experiment name* Name (or acronym) of experiment (max. length 20 characters). This name is saved in the header of the data file.

[S_RATE] – *sample rate* Sample rate: the following values can be chosen : 1ch: 50 / 100 / 200 /400 / 800 samples/sec 3ch: 50 / 100 / 200 /400 samples/sec

[CH_NUM] – *Number of channels* The value chosen defines the number of active channels

CH_NUM =1 : channel one only *CH_NUM =2* : channel one and two

CH_NUM =3 : all three channels

The maximal run time of batteries depends on the number of active channels. To save power use only channels which are necessary!

[A_CHOP] – *Chopper-mode of the ADC- input amplifier*

Is the chopper switched on (*A_CHOP=1*) the drift as well as the 1/f noise of the preamplifier is reduced. Using gain=16 (or higher) the noise below ca. 100 Hz is significantly less (up to factor 2-3).

The frequency of the chopper is 1.6 kHz.

A_CHOP =0: chopper off ; *A_CHOP =1*: chopper on.

[A_FILT] – *ADC- input highpass filter*

The high pass filter with a corner frequency of ca $f_c = 500$ Hz deletes the DC-offset .

A_FILT=0: HP Filter off; *A_FILT=1* : HP Filter on

[A_PHAS] – *digital filter characteristic*

A_PHAS=0 : linear phase; *A_PHAS=1* : minimum Phase

[PLL_XO] – *oscillator time correction*

With this parameter the stability of time for the oscillator can be further improved (differential/DIFF or absolute/PLL). This is done by detecting of differences between the constant impulse of the GPS signal (PPS) and the time of switch on [*F_TIME*] of the oscillator. The oscillator is readjusted by this difference.

PLL_XO=0: correction is off

In the DIFF (differential) mode *PLL_XO=2* the difference between only two subsequent time measurements are corrected.

In the PLL mode (absolute mode, *PLL_XO=1* it is tried to synchronise the phase of the timing cycle oscillator with the impulse of the GPS-second (PPS).

!!! The mode *PLL_XO=1* is not available at this time (and can't be chosen)!!!

[GPS_PO] – setting of actual geographic position

If the DATA-CUBE is used in a region far distant from the previous usage the GPS needs up to 15 min to find the appropriate satellites. To accelerate this process the actual geographic position can be set. Thus the time of reception the satellites is downsized.

GPS_PO=>SIP[latitude,longitude,elevation] lat : two digit integer, lon three digit integer, elev. Four digit integer. Convention: western and southern hemisphere are negative

Example: GPS_PO=SIP +52+013+0000

[F_TIME] – time interval for GFS switch on and flush of internal storage to SDHC card

This parameter defines the time interval for the active GPS (switched on). At the time of switch on the FAT of the recorded data file will be updated (flush).

Allowed values: 3-60 (min)

[GPS_TI] – switch - on time of GPS(for cycled GPS only)

This parameter defines the duration of active (switched on) GPS. (The longer the GPS is switched on the less is the run time of the batteries.

Allowed values: 3-60 (min)

[GPS_ON] – continuous GPS or cycled GPS

If you set GPS_ON=0 it means cycled GPS; if is GPS_ON=1 it means continuous GPS. In case of cycled GPS the switched on intervals and durations are defined by the parameters [F_TIME],[GPS_TI] and [GPS_OF). The run time of the batteries are determined also by these parameters. It is obvious that continuous GPS needs more power than cycled GPS.

[GPS_OF] - in case of cycled GPS only – switch off after reception of 60 valid GPS strings

If GPS_ON=0 (cycled GPS) then will be GPS switched off according the following conditions:

In case of GPS_ON=0 GPS is switched off at F_TIME

In case of GPS_ON=1 GPS is switched off after 60 valid GPS blocks (seconds) however maximal after GPS_TI. In case F_TIME=GPS_TI, GPS_TI is set equal GPS_TI-1.

In the beginning of recording GPS is switched on for 5 minutes.

[P_AMPL] -gains for preamplifier – limits of input voltages

The parameter P_AMPL= can be adjusted to the following values: 1/2/4/8/16/32/64

Corresponding to chosen values following input voltage can be recorded:

Gain 1	±2.048 V
Gain 2	±1.024 V
Gain 4	±0.512 V
Gain 8	±0.256 V
Gain 16	±0.128 V
Gain 32	±0.064 V
Gain 64	±0.032 V

[C_MODE] ADC-modes C_MODE = 0 ->LowPwr (Low Power); Mode C_MODE = 1 ->HiRes (High Resolution) *The mode high resolution mode needs more power thus the run time of batteries is reduced.*

ADC Performance

@ 100sps

		Gain 1	Gain 16	Gain 64
HiRes	SNR	125,6 dB	122,2 dB	113,5 dB
	eff. Bits	22,4 Bit	21,8 Bit	30,3 Bit
LowPwr	SNR	122,6 dB	120,7 dB	113,0 dB
	eff. Bits	21,9 Bit	21,5 Bit	20,2 Bit

[DEV_NO] SET Device Number

DEV_NO=xxx

By this parameter the number of the device is set (for instance DEV_NO=002). This number is stored in the EEprom. Subsequently the config file is cleared.

[C_OSZI]Calibrate VCTXO C_OSZI = xxx (sec) (This should be done once per year only)

Automatic calibration of the time cycle oscillator for a specified duration (typically 500-1000 sec). The value after the"=" gives the time in sec. (for instance C_OSZI=500 corresponds 500 sec duration of

calibration.) The calibration requires very good and uninterrupted reception of GPS signals. It is accomplished, when the LED's successively flash repeatedly. A log file (Dev_no-log.txt) is generated with the following structure:

Measure VCTXO to GPS Shift...

09/08/19 11:24:45

Set VCTXO 1: 2000 Set VCTXO 2: 2100 Measure Time [s]: 500

Start-Shift1: 1600

Start-Shift1: 1808

Diff.-Shift1: 147 -- Start-Shift1: 1808 -- End-Shift1: 1955

Start-Shift2: 1956

Diff.-Shift2: 7 -- Start-Shift2: 1956 -- End-Shift2: 1963

Input-> Diff.-Shift1: 147 -- Diff.-Shift2: 7 -- Set VCTXO 1: 2000 -- Set VCTXO 2: 2100

Current V_TCXO: 2103 -- Corrected value V_TCXO : 2105

Subsequently the config file is cleared.

Config file (example)

```
*****
*
* Configuration File for the 1 & 3 Channel DSS-Cubes *
*
* Software V0.1 *
*****
* Syntax: *
* - Lines beginning with a star '*' are comments (and are ignored) *
* - Empty lines are not allowed *
* - Parameter keywords are of six capitalized characters, *
* directly followed by an equal sign *
* - The parameter value starts at column #8 *
* - Line length is limited to 70 characters *
*****
***** !!! Parameters for 3 channel Cubes only !!! *****
*****
*
** Active Channels      1 = ch1 // 2 = ch1 & ch2 // 3 = ch1 to ch3
CH_NUM=3
*
** Amplifier Gain      1, 2, 4, 8, 16, 32 or 64
P_AMPL=16
*
** AD Converter Mode   0 = Low power // 1 = High resolution
C_MODE=0
*
** Amplifier Chopping  0 = off // 1 = on
A_CHOP=1
*
*****
***** General parameters for 1 and 3 channel Cubes *****
```

