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Brief Description of Vaisala DigiCORA® 3 DataBase File Format (DC3DB)

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Abstract

The format of Vaisala DigiCORA®3 DataBase files (DC3DB – "**.dc3db*" or "**.dc3*") is outlined in this document. DC3DB files are used as measurement and parameter archive files in Vaisala DigiCORA® Sounding Systems MW31 and MW21 for radiosondes. In essence, the files are in proprietary Microsoft DataBase format (MDB – "**.mdb*") of Jet version 4.0 with a well defined internal structure. Currently, however, no public documentation of the format in the form used by Vaisala is available.

The GRUAN file archive contains several tens of thousands of radiosounding files in DC3DB format. This extensive archive should be freely available to users for decades, and the data format use of the files should accordingly be documented. This Technical Note summarises the information about the DC3DB file contents and format that is available at the GRUAN Lead Centre.

Editor Remarks

Contacting GRUAN Lead Centre

Please contact the GRUAN Lead Centre (gruan.lc@dwd.de) if you have any questions or comments in relation to this document.

Revision history

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Table of contents

1 Introduction

The Vaisala DigiCoraIII (Vaisala DigiCORA®3) sounding software stores the data of a radiosounding in a specific archive file – the so called DC3DB file. A DC3DB file is essentially structured as a Microsoft Access DataBase file (*"*.mdb"*), using a complex parameter tree (see Section 2.1), real data tables (see Section 2.2), and embedded binary DUMP files (see Chapter 3). Vaisala uses the file extensions *"*.dc3db"* or *"*.dc3"*.

In general the archive files include

- final product data (after launch),
- raw data of sounding (before and after launch),
- meta-data of site, system and sounding,
- full configuration of used sounding system, and
- scripts.

Vaisala provided comprehensive documentation to customers operating the sounding system, e.g. about the ground system, software, configuration or scripting. However, documentation of the data tables in the archive files, e.g. for data analysts, is insufficient. As an offer to the users, a detailed listing of the data table contents known to the author are given in Appendix B as the core of this document.

Note: The information about the data format and the content structure (data tables) in DC3DB files were determined by the author based on the file archive at the GRUAN Lead Centre. That is, information given here is based on experience from practice and can therefore not claim to be exhaustive. Please contact the author or the GRUAN Lead Centre (gruan.lc@dwd.de), in case you are able and wish to provide further information on the DC3DB file format.

2 Structure of the database

The DataBase file (DC3DB) consists of a number of tables. The generic layout of the tables is shown in Table 1.

Microsoft Access, for example, can be used to trace the internal database structure. For this purpose the extension of the DC3DB file should be renamed to the default Microsoft DataBase file extension *"mdb"*.

Please note that there are tables with static (none mutable) names or structures, but also tables with names or structures that might change from file to file (mutable). The two none mutable tables provide keys and values of a so called parameter tree.

A full data table listing of an example sounding archive is available in Appendix A.

The introduced tables and the parameter tree are getting explained in the following two Sections 2.1 and 2.2.

Table 1: Tables of a DC3DB file

Name of Table	Mutable name	Mutable structure	Description
DB_KEYS	no	no	Definition of parameter tree
DB_VALUES	no	no	Value entries following the tree structure
*_des_*	yes	no	Definition of data tables
*_dat_*	yes	yes	Actual data table, structured as defined in the corresponding 'des'-table.
*_gen_*	yes	no	Contains the parts of a dump file

2.1 Parameter tree

The parameter tree consists of keys (*DB_KEYS*) and values (*DB_VALUES*). The complete parameter tree can also be viewed and changed directly via the DigiCora programs. The meaning of the individual branches and leaves is largely explained in the DigiCora documentation (see *Vaisala*, 2015). Therefore, only the technical structure of the parameter tree will be discussed here. Tables 2 and 3 show the definitions of the database tables *DB_KEYS* and *DB_VALUES*.

Table 2: Columns of table DB_KEYS

Name of column	Type(length)	Description
KeyID	Long	ID of the key (automatic increment, unique)
ParentKeyID	Long	Link to a parent key using ID (tree links)
KeyName	String(127)	Name of key (Encoding ISO 8859-1 / Latin-1)
NumChildren	Integer	Number of child keys
LastUpdated	Binary(16)	Date, time, and version of the last change
Status	Byte	original offset of the column

The parameter tree is composed as follows:

First the table *DB_KEYS* is looked in detail. The primary key is the column *KeyID*, and contains a unique increment number mostly starting at 1. The column *ParentKeyID* holds a link to a parent key and the column *KeyName* holds the name of this key (it could be understood as branch of the tree). The table *DB_KEYS* defines the trunk and branches of the tree. This is similar to the directories in a folder structure. And like any tree structure, it has a unique starting point. That means, there is exactly one root of the tree, which is the key with the *ParentKeyID*=0 (that means a key without a parent).

After that all subsequent keys are considered as children of another keys with *ParentKeyID*>0. That means, each key can contain any number of further keys.

Table 3: Columns of table DB_VALUES

Name of column	Type(length)	Description
KeyID	Long	Reference to the parent key by ID
KeyName	String(127)	Name of the value (Encoding ISO 8859-1 / Latin-1)
Type	Integer	Type of the value (see table 4)
Size	Long	Size of the value in Bytes
Data	Binary(255)	Short fixed defined binary field
LongData	Long Binary (OLE-Object)	Large binary field of any length
LinkedTable	String(64)	Name of the corresponding table

Second the table *DB_VALUES* is relevant to define the leafs of this tree. Such a leaf has a name which is found in column *KeyName* and holds a value. That means, here the real parameter values are stored using different data types. For getting the actual child-values stored in table *DB_VALUES*, the column *Type* has to be evaluated for the used data type and the holding data place (columns or linked table), see Table 4. The column *Size* gives the data type range, binary object size or string length respectively. Please note that with a type length (size) greater than 256, the column *LongData* and no longer *Data* is accessed.

Table 4: Types of parameter values

Nr.	Name of type	Length	Data column	Description
100	BINARY	n (1..)	Data, LongData	**Binary** - binary data with free length
111	DWORD	4	Data	**Integer** - integer number (with or without sign?)
115	MULTI_SZ	n (1..)	Data, LongData	**String** - multi-line text (with line breaks)
117	SZ	n (1..256)	Data	**String** - single-line text (without line breaks)
118	DOUBLE	8	Data	**Double** - floating point value double precision
119	TABLE	64	LinkedTable	[unknown]

The text data are (most likely) contained in the 1 byte encoding ISO 8859-1 / Latin-1. The binary data definition differs from value to value and is (so far) not yet decoded. The key column *LastUpdated* is interesting in this context, because it contains a binary value which includes a time stamp and a version number (or something like that). The following 8 Short Integers (Big-Endian) are included: year (4 digits), month (2 digits), version number (2 digits), day (2 digits), hour (2 digits), minute (2 digits), second (2 digits), 1/1000 second (3 digits). The timestamp shows the last change of one of the child elements.

The following example illustrates the structure of such a parameter tree. The groups (*DB_KEYS*) are assigned the timestamps, the values (*DB_VALUES*) the stored data. The backslash "\" is used as separator:

```
# root parameter of parameter tree with timestamp & status
# (it is a group/folder)
L3753027!00                          2016-08-31T10:01:31.060 (00|03)

# child of root parameter (also a group/folder)
L3753027!00\Config                   2008-05-08T06:24:27.435 (00|04)

# child of a child (also a group/folder) with three values located in
L3753027!00\Config\WorkStationSW     2015-12-10T15:24:29.999 (00|04)
L3753027!00\Config\WorkStationSW\MW31Version3641Updated = 3.64.1-->3.66.0
L3753027!00\Config\WorkStationSW\MW31Version3660Updated = 3.66-->3.66.1
L3753027!00\Config\WorkStationSW\Version                = MW31_3.66.1

# another child of root parameter (also a group/folder)
L3753027!00\RsGroundCheck            2016-08-31T10:11:17.981 (00|03)

# child of a child (also a group/folder) with four values located in
L3753027!00\RsGroundCheck\Corrections     2016-08-31T10:11:18.029 (00|03)
L3753027!00\RsGroundCheck\Corrections\Humidity1         = 0.112810
L3753027!00\RsGroundCheck\Corrections\Humidity2         = 0.214492
L3753027!00\RsGroundCheck\Corrections\Pressure          = -1.212549
L3753027!00\RsGroundCheck\Corrections\Temperature       = -0.106631

# value directly located in group/folder of root parameter
L3753027!00\RsNumber=L3753027
```

In contrast to information about the file format DC3DB itself and the data tables, some interesting details about the metadata can be found in the official Vaisala documentation (*Vaisala*, 2015).

2.2 Data tables

There are two different types of data tables, the standard *"dat"* tables and the binary *"gen"* tables. Additionally each of these tables has another *"des"* table as describing supplement. The tables names are somewhat cryptic, but always contain three important parts. This will be shown with an example:

```
# Names related to data table 'EDT':
  >> EDT_des_____________________A7E204ED_DD6F_4FCE_A719_38ED6C0242BD
  >> EDT_dat_____________________E76B608E_A91F_43E4_9466_094F8963902F
#
# Names related to data table 'FLEDT':
  >> FLEDT_des___________________9E298E0D_411F_4DBF_8057_321C4827DC65
```

```
  >> FLEDT_gen___________________68F1F6CC_BEDB_4564_B84E_5D55C4AF57F1
#
#    |     |                     |
#    |     |                     + a binary key [unknown meaning]
#    |     + Type of table
#    + Name of data table
```

An additional example can be found in Appendix A.

The following listing shows the differences of two *"des"* tables, one related to *"gen"* and another related to *"dat"*:

```
# Content of EDT_des_____________________A7E204ED_DD6F_4FCE_A719_38ED6C0242BD
# >> related to EDT_dat_...
RowID, ItemName,  ItemUnit, FLType, FLTypeLength, Scale, Offset, DB_TYPE, DB_TYPE_LEN
    1,     time,       sec,      5,            4,     1,      0,     118,           8
    2,     Pscl, ln scaled,      3,            2,     1,      0,     118,           8
    3,        T,         K,      3,            2,    10,      0,     118,           8
    4,       RH,         %,      3,            2,     1,      0,     118,           8
    5,        v,       m/s,      3,            2,  -100,      0,     118,           8
    6,        u,       m/s,      3,            2,  -100,      0,     118,           8
    7,   Height,         m,      3,            2,     1,  30000,     118,           8
    8,        P,       hPa,      3,            2,    10,      0,     118,           8
    9,       TD,         K,      3,            2,    10,      0,     118,           8
   10,       MR,      g/kg,      3,            2,   100,      0,     118,           8
   11,       DD,       dgr,      3,            2,     1,      0,     118,           8
   12,       FF,       m/s,      3,            2,    10,      0,     118,           8
   13,       AZ,       dgr,      3,            2,     1,      0,     118,           8
   14,    Range,         m,      3,            2,  0.01,      0,     118,           8
   15,      Lon,       dgr,      3,            2,   100,      0,     118,           8
   16,      Lat,       dgr,      3,            2,   100,      0,     118,           8
   17,   SpuKey,  bitfield,      8,            2,     1,      0,     118,           8
   18,   UsrKey,  bitfield,      8,            2,     1,      0,     118,           8
   19,   RadarH,         m,      3,            2,     1,  30000,     118,           8
#
# Content of FLEDT_des___________________9E298E0D_411F_4DBF_8057_321C4827DC65
# >> related to FLEDT_gen_...
RowID, ItemName,  ItemUnit, FLType, FLTypeLength, Scale, Offset, DB_TYPE, DB_TYPE_LEN
    1,     data,        na,  65522,       272120,     1,      0,     100,      272120
```

The exact (fixed) definition of a *"des"* table is shown in table 5. If the *"des"* table contains only the single row with the *ItemName* *"data"*, then the corresponding data table is a parted dump file. In order to reconstruct such a file, all values of the data column of the associated *"gen"* table must be read out binary and (without any conversion!) saved one after the other as a binary file (on a byte by byte basis). The preceding column *RowID* exactly defines the order. The exact structure of such a dump file is described in more detail in the corresponding Chapter 3.

The following table 6 contains the exact (fixed) definition of a *"gen"* table. The column data is of particular interest here. The parts of the dump file are always defined as follows: The first part is always the complete header (length 12,504 bytes). Then follow n further parts á 201**RecordLen* bytes according to the number of records. The last part can of course be correspondingly shorter.

The *"dat"* tables are structured as defined in the corresponding *"des"* table. In addition there is the column *RowID*. It is always defined in the same way as the *"gen"* tables (see Table 6). The data types used within the database are those in the column *DB_TYPE* (with length *DB_TYPE_LEN*). The DC3 types originally used are defined in *FLType* (with length *FLType-Length*). The values for scaling (scale and offset) are not included in the data and are only used to map the originally packed data as original DC3 types.

Table 5: Columns of 'des' tables

Name of column	Type(length)	Description
RowID	Long	ID of the row (automatic counting; unique)
ItemName	String(32)	Name of the data column
ItemUnit	String(32)	Unit of the data column
FLType	Double	Original type of the data column
FLTypeLength	Double	Original length of type of the data column
Scale	Double	Original scale factor of the data column
Offset	Double	Original offset of the data column
DB_TYPE	Double	Current type in the database
DB_TYPE_LEN	Double	Current length of the type in the database

Table 6: Columns of 'gen' tables

Name of column	Type(length)	Description
RowID	Long	ID of the row (automatic counting; unique)
data	Long Binary (OLE object)	Parts of the binary dump file

Note: Data columns with the types Double or Float (perhaps also Integer) contain error values or NaN (not a number) values with the value -32768.0.

The author is aware of a number of data tables which can be contained in DC3DB files. Also the exact structure for many tables is known and also the meaning for many tables and their columns is known. This information can be found in the Appendix B, but unfortunately it is not complete yet.

3 Structure of internal dump file

The actual data is stored in a so-called dump file, which is a binary, proprietary and undocumented format. In the Table 8 all information which the author knows about the structure of these files are listed. Such a dump file always contains a header with the column definitions and further general information about the data table (map). And then the actual data always follow line by line (records).

```
# =======================================================
# Header  (12,504 bytes)
# =======================================================
```

```
# PART 1 of header:
# List of column definitions (128 * 96 = 12,288 bytes)
# -------------------------------------------------------
Def. of column 1   (96 bytes)
Def. of column 2   (96 bytes)
...
Def. of column 128 (96 bytes)
# -------------------------------------------------------
# PART 2 of header:
# Map information (216 bytes)
# -------------------------------------------------------
RecordLen, RecordCount, SondeID, SoundingSet, ...
# =======================================================
# Map data  (RecordCount * RecordLen bytes)
# =======================================================
Record 1           (RecordLen bytes)
Record 2           (RecordLen bytes)
...
Record RecordCount (RecordLen bytes)
# =======================================================
```

According to current knowledge of the author, the header always has the same length of 12,504 bytes and always contains the space for 128 column definitions, whereby of course only the first few are really defined. The empty column definitions can be recognised by the interpretation of the type (*Type* = 0).

> **Note:** It is important to know that the file is stored as **big-endian** (not PC compatible) and that the data has to be swapped accordingly.

The second part of the dump file – the records – are exactly built based on the column definitions. Therefore, it is important to know how the different data types are defined. Table 7 lists all data types (known to the author). A record has exactly the length of the sum of all *TypeLen* and should always match the specification *RecordCount*. The total length of the map is calculated from *RecordCount* * *RecordLen*.

Table 7: Internal data types of DUMP files

No.	Data type	Length	Data range	Description
0	undefined	0	[nothing]	Column is not defined
1	int	4	$-2.147.483.648$ to $+2.147.483.647$	**Integer** - signed integer
2	DWORD	4	0 to $+4.294.967.295$	**[unknown]** – currently mostly interpreted as integer, but is perhaps always Unsigned Integer
3	short	2	-32.768 to $+32.767$	**Short Integer** - short signed integer
4	byte	1	0 to 255	**Byte** – positive integer – sometimes incorrectly longer length, but then actually binary (No. 9) is meant
5	float	4	$\pm 10^{38}$ to 10^{-44}	**Float** - floating point value of simple precision (7 digits, IEEE 754)
6	double	8	$\pm 10^{308}$ to 10^{-323}	**Double** - floating point value of double precision (15 digits, IEEE 754)
7	string	n (1..)	[0 to 255]	**String** - Text of free length (1 byte char array; Encoding=[unknown])
8	unsigned short	2	0 to $+65.535$	**Unsigned Short Integer** - short positive integer
9	binary	n (1..)	[0 to 255]	**Binary** - binary data of free length

Table 8: Structure of a DUMP file

Name	**Type(length)**	**Description**
Definition of all columns (128 definitions á 96 Bytes yield in total 12,288 Bytes) – a definition of one column is 96 Bytes		
Type	Integer(4)	Type of column (see definition of types at table 7)
TypeLen	Integer(4)	Length of such column in Bytes
[unknown]	Integer(4)	So far always 0 – unknown meaning
[unknown]	Integer(4)	So far always 0 – unknown meaning
Name	String(32)	Name of column
Unit	String(32)	Unit of column
Divisor	Double(8)	Divisor with which the column is calculated – must be calculated out, if the actual value is searched for
Offset	Double(8)	Offset with which the column is calculated – must be calculated out, if the actual value is searched for
Information about map (216 Bytes)		
RecordLen	Integer(4)	Length of one record
RecordCount	Integer(4)	Count of records in map
SondeID	String(128)	Unique name of the radiosonde (ID) – it could be that there is further information in this file
SoundingSet	Integer(4)	Number of sounding
MapName	String(64)	Name of the map (data table) – it could be that there is further information in it
DataChunkCount	Integer(4)	Count of data block
RecordMaxCount	Integer(4)	Maximum number of records in a data block
[unknown]	Integer(4)	So far always 0 – unknown meaning – maybe 'Circular'?
Map data (RecordCount * RecordLen Bytes) – A record is structured exactly as specified by the types (and their lengths) of the column definition.		

Appendix

A Example of a table listing of one DC3DB file

The following set shows an data table listing of a sounding archive file that could be viewed with Microsoft Access. Please note, each line indicates one table name with a human readable part and separated binary key (see also first example in Section 2.2):

```
# All tables of example file ‘Lindenberg_20170321_104624.dc3db’
#
# tables with fixed names (hold the parameter tree):
DB_KEYS
DB_VALUES
#
# tables hold definitions of data tables:
EDT_des_____________________A7E204ED_DD6F_4FCE_A719_38ED6C0242BD
FLEDT_des___________________9E298E0D_411F_4DBF_8057_321C4827DC65
FLSTD_des___________________0EA10C76_2E0E_460B_BE0D_D1A67798ABB1
FRAWPTU_des_________________14A3D35E_1A5D_4343_9A59_49392F025C9F
GPS_ORB_des_________________B2FB4B6F_C64A_49D9_ABA5_FDFB0A5CE03F
GPSCCLOC_des________________44C3830C_7974_4A0A_AA0F_B47440CBC2AB
GPSCCREM_des________________4DB54FCC_CE07_4906_8FD2_F5CD07891263
GPSDCC_RESULT_des___________ADAF680A_2F48_4C53_93A9_5E8970ECF8EB
RAWPTUPOS_des_______________96AA627B_794C_4813_BD5A_8D6C1EA68B62
RS92SONDEID_des_____________DF7977ED_ABD9_40B6_89B3_7F2E29E9BA32
RSSTATUS_des________________77B18591_4710_44E0_BDE2_E29C30E523A9
SENS9FRQ_des________________FD66BD6C_CEAB_40E1_8AEC_373EA0EE8375
STD_des_____________________EFD6FD6A_140D_4F59_8467_1384673872ED
#
# tables hold real data (final product only):
EDT_dat_____________________E76B608E_A91F_43E4_9466_094F8963902F
STD_dat_____________________88A85F88_AE44_4961_92E7_00DF5C5A51AE
#
# tables hold parts of dump files (raw data and final product):
FLEDT_gen___________________68F1F6CC_BEDB_4564_B84E_5D55C4AF57F1
FLSTD_gen___________________5E25317A_711B_4F7D_9FD1_B318C32FAC89
FRAWPTU_gen_________________B49CED32_7F9E_491C_BC54_C45494D1AA00
GPS_ORB_gen_________________B400FA6F_F22A_4511_BE3C_F658D1CBE300
GPSCCLOC_gen________________3750D917_9D0E_49EC_A1C9_8F694D56852B
GPSCCREM_gen________________59B15EFC_F7B0_464B_B4C8_7FFB1749A8D7
GPSDCC_RESULT_gen___________8FF04438_A250_422A_AC08_86F7518F674D
RAWPTUPOS_gen_______________6F840029_6975_45BC_B426_2FDD872DB38A
RS92SONDEID_gen_____________D86162C0_4D93_4792_808B_CC0E676502E4
RSSTATUS_gen________________76D104D2_7C45_4ECA_B859_5D1D63E8B6C7
SENS9FRQ_gen________________02253881_9194_4756_9A97_CE1923414933
```

B Overview about all known data tables of DC3DB files

B.1 List of tables

Table 9: List of known data tables which can be part of DC3DB files

Name	**Description**
CALC_OZONE	Calculated ozone data (see Section B.2)
CALC_RADAC	Calculated radac(radio activity) data (*details unknown*)
EDT, FLEDT	EDT data – the Vaisala data product (see Section B.3)
FRAWPTU	Raw PTU data (see Section B.4)
FRQ8NOISE	Noise of RS80 radiosonde sensor frequencies, internal use (*details unknown*)
FRQ9NOISE	Noise of RS90 radiosonde sensor frequencies, internal use (*details unknown*)
GPS_LOC	GPS local measurements (see Section B.5)
GPS_ORB	GPS satellite orbit parameters (see Section B.6)
GPS_PLL	GPS remote measurements (see Section B.7)
GPS_STATUS	GPS status (see Section B.8)
GPS_WIND	GPS raw wind data (see Section B.9)
GPSCCLOC	GPS local measurements in ccGPS (see Section B.10)
GPSCCREM	GPS remote measurements in ccGPS (see Section B.11)
GPSDCC_ORB	Internal use only (*details unknown*)
GPSDCC_RESULT	GPS raw wind data in ccGPS (see Section B.12)
LCPHASE	Internal use only (see Section B.13)
LOR_LOC	Loran-C local data (see Section B.14)
LOR_REM	Loran-C remote(radiosonde) data (see Section B.15)
LOR_STATUS	Loran-C status data (see Section B.16)
ODT	Intermediate ozone data, internal use only (*details unknown*)
OIF92_CHANNELS	Internal use only (*details unknown*)
OZONE	Raw ozone data (*details unknown*)
PTUCALC_RESULT	Edited raw PTU (*details unknown*)
RAD_STATUS	Radio status, internal use (see Section B.17)

This table is continued on the next page.

Table 9 – *Continued from previous page*

Name	**Description**
RADAC	Raw radac (radio activity) data (*details unknown*)
RADIOLOG	Radio log (UPP210 only) (see Section B.18)
RDT	Intermediate radac data, internal use only (*details unknown*)
RS92SONDEID	RS92 radiosonde status data (see Section B.19)
RSFRAME	RS92 radiosonde frame data (*details unknown*)
RSSTATUS	SW radio channel status (see Section B.20)
RTANGLES	Elevation/azimuth angles from RT20A (*details unknown*)
RTC_STATUS	Status data from RTC21 (*details unknown*)
SENS8FRQ	RS80 radiosonde sensor frequencies (see Section B.21)
SENS9FRQ	RS90 radiosonde sensor frequencies (see Section B.22)
SPECSENS	Internal use only (*details unknown*)
SPECSENSORS	Internal use only (see Section B.23)
SPECTRUM	SW radio spectrum (*details unknown*)
STD, FLSTD	STD data (see Section B.24)
WINDCALC_RESULT	Calculated raw wind data (*details unknown*)
RADARRAW	Radar data (*details unknown*)
SURFOBS	Surface observation data from AWS (*details unknown*)

B.2 Table "CALC_OZONE"

The table "CALC_OZONE" contains calculated ozone data.

Table 10: List of all columns of table "CALC_OZONE"

Id	**Unit**	**Data type**	**Description**
time	sec	float (4)	Time, Elapsed time since sonde release
O3	mPa	float (4)	*[blank]*
Tbox	C	float (4)	*[blank]*
Total	DU	float (4)	*[blank]*
Residual	DU	float (4)	*[blank]*
AUX	?	float (4)	*[blank]*

This table is continued on the next page.

Table 10 – *Continued from previous page*

Id	Unit	Data type	Description
Voltage	V	float (4)	*[blank]*

B.3 Tables “EDT” and “FLEDT”

This table can be available at two different positions in the DC3DB file: as real data base table “EDT” or as internal dump file “FLEDT”. Also these tables have equal structure like “STD” and “FLSTD” (see Section B.24).

Note: Source of details is section 2.2 “ Edited Data” of technical document *Vaisala* (2018) on page 7.

Table 11: List of all columns of table “FLEDT”

Id	Unit	Data type	Description
time	sec	float (4)	Time, Elapsed time since sonde release
Pscl	ln scaled	float (4)	Scaled logarithmic pressure, $4096 * \ln P$ hPa
T	K	float (4)	Temperature
RH	%	float (4)	Humidity
v	m/s	float (4), div=-1	North component of wind, Positive when flow from North
u	m/s	float (4), div=-1	East component of wind, Positive when flow from East
Height	m	float (4)	Altitude above mean sea level
P	hPa	float (4)	Pressure
TD	K	float (4)	Dew point temperature
MR	g/kg	float (4)	Mixing ratio
DD	dgr	float (4)	Wind direction
FF	m/s	float (4)	Wind speed
AZ	dgr	float (4)	Azimuth to the sonde
El	dgr	float (4)	Elevation to the sonde
Range	m	float (4)	Horizontal distance to the sonde
Lon	dgr	float (4)	Sonde position longitude

This table is continued on the next page.

Table 11 – *Continued from previous page*

Id	**Unit**	**Data type**	**Description**
Lat	dgr	float (4)	Sonde position latitude
SpuKey	bitfield	unsigned short (2)	SOND calculated significance key, see below
UsrKey	bitfield	unsigned short (2)	User edited/recalculated significance key, see below
RadarH	m	float (4)	Radar height

Significance key bit pattern:

```
Bit  15  14  13  12  11  10   9   8   7   6   5   4   3   2   1   0
Flag Fs  Ds  V   Mw  x    x   x   x   x   Ui  Tu  Pi  ITr Tr  Us  Ts
```

When bit is 1 the data level has the following level type:

```
Bit      Level type flag
0    Ts  Significance level of temperature
1    Us  Significance level of humidity
2    Tr  Tropopause
3    ITr Incompletely defined tropopause
4    Pi  Pressure interpolated
5    Ti  Temperature interpolated
6    Ui  Humidity interpolated
7 - 11   Don't care
12   Mw  Maximum wind
13   V   Significance level of wind using vector criteria
14   Ds  Significance level of wind direction
15   Fs  Significance level of wind speed
```

B.4 Table "FRAWPTU"

The table "FRAWPTU" contains the raw PTU data (pressure, temperature, humidity). In case of radiosonde model RS92 two humidity sensors 1 & 2 are available.

> **Note:** Source of details is section 2.1 "Raw PTU Data" of technical document *Vaisala* (2018) on page 7.

Table 12: List of all columns of table "FRAWPTU"

Id	**Unit**	**Data type**	**Description**
time	sec, s	float (4)	Time, Time since sounding system time reset
P	hPa	float (4)	Pressure

This table is continued on the next page.

Table 12 – *Continued from previous page*

Id	Unit	Data type	Description
T	K	float (4)	Temperature
U1	%	float (4)	Humidity sensor 1
U2	%	float (4)	Humidity sensor 2

B.5 Table "GPS_LOC"

The table "GDP_LOC" contains GPS measurements of local antenna at ground station.

Note: Source of details is section 2.14 "GPS Station Data" of technical document *Vaisala* (2018) on page 18.

Table 13: List of all columns of table "GPS_LOC"

Id	Unit	Data type	Description
time	sec, s	float (4)	Time, Record time stamp
GPSWeek	?	unsigned short (2)	GPS week number, Record GPS week stamp
GPSTime	?, s	double (8)	GPS time of week, Record GPS time stamp
Count	?	byte (1)	Number of observations, Number of valid channels observed
Alo_Id_1	?	byte (1)	Satellite PRN code 1, Satellite PRN code tracked by channel 1
Alo_Freq_1	?, Hz	float (4)	Frequency observable 1, Doppler frequency measurement in channel 1
Alo_Id_2	?	byte (1)	Satellite PRN code 2, Satellite PRN code tracked by channel 2
Alo_Freq_2	?, Hz	float (4)	Frequency observable 2, Doppler frequency measurement in channel 2
Alo_Id_3	?	byte (1)	Satellite PRN code 3, Satellite PRN code tracked by channel 3
Alo_Freq_3	?, Hz	float (4)	Frequency observable 3, Doppler frequency measurement in channel 3

This table is continued on the next page.

Table 13 – *Continued from previous page*

Id	Unit	Data type	Description
Alo_Id_4	?	byte (1)	Satellite PRN code 4, Satellite PRN code tracked by channel 4
Alo_Freq_4	?, Hz	float (4)	Frequency observable 4, Doppler frequency measurement in channel 4
Alo_Id_5	?	byte (1)	Satellite PRN code 5, Satellite PRN code tracked by channel 5
Alo_Freq_5	?, Hz	float (4)	Frequency observable 5, Doppler frequency measurement in channel 5
Alo_Id_6	?	byte (1)	Satellite PRN code 6, Satellite PRN code tracked by channel 6
Alo_Freq_6	?, Hz	float (4)	Frequency observable 6, Doppler frequency measurement in channel 6
Alo_Id_7	?	byte (1)	Satellite PRN code 7, Satellite PRN code tracked by channel 7
Alo_Freq_7	?, Hz	float (4)	Frequency observable 7, Doppler frequency measurement in channel 7
Alo_Id_8	?	byte (1)	Satellite PRN code 8, Satellite PRN code tracked by channel 8
Alo_Freq_8	?, Hz	float (4)	Frequency observable 8, Doppler frequency measurement in channel 8
Alo_Id_9	?	byte (1)	Satellite PRN code 9, Satellite PRN code tracked by channel 9
Alo_Freq_9	?, Hz	float (4)	Frequency observable 9, Doppler frequency measurement in channel 9
Alo_Id_10	?	byte (1)	Satellite PRN code 10, Satellite PRN code tracked by channel 10
Alo_Freq_10	?, Hz	float (4)	Frequency observable 10, Doppler frequency measurement in channel 10
Alo_Id_11	?	byte (1)	Satellite PRN code 11, Satellite PRN code tracked by channel 11
Alo_Freq_11	?, Hz	float (4)	Frequency observable 11, Doppler frequency measurement in channel 11
Alo_Id_12	?	byte (1)	Satellite PRN code 12, Satellite PRN code tracked by channel 12

This table is continued on the next page.

Table 13 – *Continued from previous page*

Id	Unit	Data type	Description
Alo_Freq_12	?, Hz	float (4)	Frequency observable 12, Doppler frequency measurement in channel 12
Pos_x	?, m	double (8)	x-coordinate, WGS-84 X-coordinate of the station (GPS antenna)
Pos_y	?, m	double (8)	y-coordinate, WGS-84 Y-coordinate of the station (GPS antenna)
Pos_z	?, m	double (8)	z-coordinate, WGS-84 Z-coordinate of the station (GPS antenna)
Vel_x	?, m/s	double (8)	x-velocity, Station (GPS antenna) velocity along the WGS-84 X-axis
Vel_y	?, m/s	double (8)	y-velocity, Station (GPS antenna) velocity along the WGS-84 Y-axis
Vel_z	?, m/s	double (8)	z-velocity, Station (GPS antenna) velocity along the WGS-84 Z-axis
PDOP	?	unsigned short (2)	Position Dilution Of Precision (PDOP), 100*PDOP of the tracked satellite geometry
Offset	?, m	float (4)	Receiver clock offset in meters, Station GPS receiver clock offset

B.6 Table "GPS_ORB"

The table "GPS_ORB" contains GPS satellite orbit parameters.

Note: Source of details is section 2.15 "GPS Satellite Orbit Data Byte Data Unit" of technical document *Vaisala* (2018) on page 19.

Table 14: List of all columns of table "GPS_ORB"

Id	Unit	Data type	Description
time	sec	float (4)	Time, Record time stamp
GPSWeek	?	unsigned short (2)	GPS week number, Record GPS week stamp
GPSTime	?, s	double (8)	GPS time of week, Record GPS time stamp

This table is continued on the next page.

Table 14 – *Continued from previous page*

Id	Unit	Data type	Description
Type	?	byte (1)	Record type, 1 = almanac data, 2 = ephemeris data
SetTime	?	dword (4)	*[blank]*
ID	?	short (2)	[1..32] Satellite PRN number for these orbit parameters
tUp	?, s	dword (4)	Time updated, Seconds of GPS week
tObs	?	dword (4)	*[blank]*
health	?	byte (1)	Satellite health, health=0
Aspoof	?	byte (1)	*[blank]*
teGPS	?, s	dword (4)	Orbit data reference time, Reference time in total GPS time
Week	?	unsigned short (2)	Orbit data reference week number, GPS reference week for orbit parameters
Toe	?, s	double (8)	Orbit data reference time of week, GPS reference time of week for orbit parameters
Ecc	?	double (8)	Eccentricity, Orbit eccentricity
A	?	double (8)	Square root of semimajor axis, $\sqrt{m}$
ArgPerigee	?, rad	double (8)	Argument of perigee, $-\pi...\pi$
MeanA0	?, rad	double (8)	Mean anomaly at reference time, $-\pi...\pi$
Ra0	?, rad	double (8)	Right ascension (longitude of ascending node) at reference time, $-\pi...\pi$
RaDot	?, rad/s	double (8)	Rate of right ascension
MeanMdiff	?, rad/s	double (8)	Mean motion difference, zero for almanac data
IO	?, rad	double (8)	Inclination angle at ref. time, $-\pi...\pi$
IDot	?, rad/s	double (8)	Inclination angle rate, Valid only for ephemeris data
Lacos	?, rad	double (8)	Latitude cos harmonic correction, Valid only for ephemeris data
Lasin	?, rad	double (8)	Latitude sin harmonic correction, Valid only for ephemeris data

This table is continued on the next page.

Table 14 – *Continued from previous page*

Id	Unit	Data type	Description
Orbcos	?, m	double (8)	Orbit radius cos harmonic correction, Valid only for ephemeris data
Orbsin	?, m	double (8)	Orbit radius sin harmonic correction, Valid only for ephemeris data
Inccos	?, rad	double (8)	Inclination cos harmonic correction, Valid only for ephemeris data
Incsin	?, rad	double (8)	Inclination sin harmonic correction, Valid only for ephemeris data
AccAlert	?	byte (1)	User range accuracy, Valid only for ephemeris data
WeekC	?	unsigned short (2)	GPS week number, Valid only for ephemeris data
Tow	?, s	double (8)	toc, Valid only for ephemeris data
Af0	?, s	double (8)	AF0 Clock correction
Af1	?, s/s	double (8)	AF1 Clock correction
Af2	?, s/s/s	double (8)	AF2 Clock correction, Valid only for ephemeris data
GroupDelay	?	double (8)	Group delay, Valid only for ephemeris data
IODE	?	unsigned short (2)	Issue of ephemeris data, Valid only for ephemeris data

B.7 Table "GPS_PLL"

The table "GPS_PLL" contains GPS measurements of the remote (flying) radiosonde instrument.

Note: Source of details is section 2.13 "GPS Radiosonde Data" of technical document *Vaisala* (2018) on page 17.

Table 15: List of all columns of table "GPS_PLL"

Id	Unit	Data type	Description
time	sec, s	float (4)	Time, Record time stamp

This table is continued on the next page.

Table 15 – *Continued from previous page*

Id	Unit	Data type	Description
GPSWeek	?	unsigned short (2)	GPS week number, Record GPS week stamp
GPSTime	?, s	double (8)	GPS time of week, Record GPS time stamp
FrameCntr	?	dword (4)	Frame counter, Running number of GPS data frame sent by the sonde.
TrackMask	?	byte (1)	Track status flags, Satellite tracking status of PLL channels. 1 bit for each channel. If the bit is set the corresponding channel is in track (otherwise sweeping). LSB is for channel 1 etc.
freq_1	?, Hz	float (4)	Frequency observable 1, Doppler frequency measurement of channel 1
df_1	?	byte (1)	Detection flag 1, Detection count (0...50) of the signal in channel 1. Describes quality of the frequency measurement (50 = Best quality).
dets_1	?	float (4)	Detector signal level 1, Signal strength of the measured signal in channel 1
freq_2	?, Hz	float (4)	Frequency observable 2, Channel 2 frequency
df_2	?	byte (1)	Detection flag 2, Channel 2 detection count
dets_2	?	float (4)	Detector signal level 2, Channel 2 signal strength
freq_3	?, Hz	float (4)	Frequency observable 3, Channel 3 frequency
df_3	?	byte (1)	Detection flag 3, Channel 3 detection count
dets_3	?	float (4)	Detector signal level 3, Channel 3 signal strength
freq_4	?, Hz	float (4)	Frequency observable 4, Channel 4 frequency
df_4	?	byte (1)	Detection flag 4, Channel 4 detection count

This table is continued on the next page.

Table 15 – *Continued from previous page*

Id	Unit	Data type	Description
dets_4	?	float (4)	Detector signal level 4, Channel 4 signal strength
freq_5	?, Hz	float (4)	Frequency observable 5, Channel 5 frequency
df_5	?	byte (1)	Detection flag 5, Channel 5 detection count
dets_5	?	float (4)	Detector signal level 5, Channel 5 signal strength
freq_6	?, Hz	float (4)	Frequency observable 6, Channel 6 frequency
df_6	?	byte (1)	Detection flag 6, Channel 6 detection count
dets_6	?	float (4)	Detector signal level 6, Channel 6 signal strength
freq_7	?, Hz	float (4)	Frequency observable 7, Channel 7 frequency
df_7	?	byte (1)	Detection flag 7, Channel 7 detection count
dets_7	?	float (4)	Detector signal level 7, Channel 7 signal strength
freq_8	?, Hz	float (4)	Frequency observable 8, Channel 8 frequency
df_8	?	byte (1)	Detection flag 8, Channel 8 detection count
dets_8	?	float (4)	Detector signal level 8, Channel 8 signal strength

B.8 Table "GPS_STATUS"

The table "GPS_STATUS" contains GPS status information about local GPS antenna at ground station and remote (flying) radiosonde instrument.

Table 16: List of all columns of table “GPS_STATUS”

Id	Unit	Data type	Description
time	sec	float (4)	Time, Record time stamp
systime	sec	float (4)	*[blank]*
GPSWeek	?	unsigned short (2)	GPS week number, Record local GPS week stamp
GPSTime	?	double (8)	GPS time of week, Record local GPS time stamp
loc	?	binary (12)	*[blank]*
remtime	sec	float (4)	*[blank]*
remGPSWeek	?	unsigned short (2)	GPS week number, Record remote GPS week stamp
remGPSTime	?	double (8)	GPS time of week, Record remote GPS time stamp
rem	?	byte (1)	*[blank]*

B.9 Table “GPS_WIND”

The table “GPS_WIND” contains raw wind data based on the GPS measurements.

Note: Source of details is section 2.12 “GPS Raw Wind Data” of technical document *Vaisala* (2018) on page 16.

Table 17: List of all columns of table “GPS_WIND”

Id	Unit	Data type	Description
time	sec, s	float (4)	Time, Record time stamp
Weast	? m/s, 0.01 m/s	short (2)	East component of wind, Positive when flow from East
Wnorth	? m/s, 0.01 m/s	short (2)	North component of wind, Positive when flow from North
Wvert	? m/s, 0.01 m/s	short (2)	Ascent rate, + = up, - = down
peast	m	float (4)	Position east, Estimated radiosonde position east of launch site. + = East. - = West.

This table is continued on the next page.

Table 17 – *Continued from previous page*

Id	Unit	Data type	Description
pnorth	m	float (4)	Position north, Estimated radiosonde position north of launch site. + = North. - = South.
pheight	m	float (4)	Height, Estimated radiosonde height above the tangent plane of launch site.
PDOP	?	unsigned short (2)	Position Dilution Of Precision (PDOP), 100.0*PDOP of the satellite geometry used in the wind solution.
CHISQR	?	unsigned short (2)	*[blank]*
channelIdf	?	binary (8)	Channel 1 - 8 identification, One byte mask for each channel in the array (MSB). [7] = Channel is used in solution, [6] = Differential observation for satellite in channel available, [5-0] = Satellite PRN number +1
GPStime	ms	int (4)	GPS time, GPS time stamp for this record
trace1	?	float (4)	Trace element 1 float Trace element (1,1) of the design matrix $(A^T A)^-1$
trace2	?	float (4)	Trace element 2, Trace element (2,2)
trace3	?	float (4)	Trace element 3, Trace element (3,3)
trace4	?	float (4)	Trace element 2, Trace element (4,4)
IFfreq	?, Hz	float (4)	IF frequency, Intermediate frequency of the radiosonde GPS receiver. Available for a valid wind solution.
channelStat	?	binary (8)	Channel 1 to 8 detection count, Detection count (0...50) of the signal in the radiosonde PLL channel 1 to 8. Describes quality of the frequency measurement (50 = Best quality).
reserved1	?	unsigned short (2)	*[blank]*
reserved2	?	unsigned short (2)	*[blank]*

This table is continued on the next page.

Table 17 – *Continued from previous page*

Id	Unit	Data type	Description
reserved3	?	unsigned short (2)	*[blank]*

B.10 Table "GPSCCLOC"

The table "GPSCCLOC" contains measurements in ccGPS of local GPS antenna at ground station. The RS92 radiosondes with GPS windfinding are based on code-correlating GPS (ccGPS) receivers.

Table 18: List of all columns of table "GPSCCLOC"

Id	Unit	Data type	Description
time	s	float (4)	Time, Record time stamp
wGPSWeek	week	unsigned short (2)	*[blank]*
dSecOfGPSWeek	s	double (8)	*[blank]*
lClockBias	32 ms	int (4)	*[blank]*
lLatitude	deg	int (4), div=1745329	*[blank]*
lLongitude	deg	int (4), div=1745329	*[blank]*
wHeight	m	unsigned short (2), off=-1000	*[blank]*
nVelocityNorth	m/s	short (2), div=100	*[blank]*
nVelocityEast	m/s	short (2), div=100	*[blank]*
nVelocityUp	m/s	short (2), div=100	*[blank]*
PDOP	?	byte (1), div=10	*[blank]*
NumSatellites	?	byte (1)	*[blank]*
satellite	?	binary (168)	*[blank]*

B.11 Table "GPSCCREM"

The table "GPSCCREM" contains GPS measurements in ccGPS of remote (flying) radiosonde instrument. The RS92 radiosondes with GPS windfinding are based on code-correlating GPS (ccGPS) receivers.

Table 19: List of all columns of table "GPSCCREM"

Id	Unit	Data type	Description
time	s	float (4)	Time, Record time stamp
GPSWeek	?	unsigned short (2)	*[blank]*
SecOfGPSWeek	s	double (8)	*[blank]*
FrameCounter	?	unsigned short (2)	*[blank]*
BinData	?	binary (122)	*[blank]*

B.12 Table "GPSDCC_RESULT"

The table "GPSDCC_RESULT" contains results of GPS measurements using ccGPS of remote (flying) radiosonde instrument. The RS92 radiosondes with GPS windfinding are based on code-correlating GPS (ccGPS) receivers.

Table 20: List of all columns of table "GPSDCC_RESULT"

Id	Unit	Data type	Description
time	s	float (4)	Time, Record time stamp
wGPSWeek	?	unsigned short (2)	GPS week
dSecOfGPSWeek	s	double (8)	Second of GPS week
DataVerNo	?	byte (1)	*[blank]*
dSondeX	m	double (8)	Radiosonde X position
dSondeY	m	double (8)	Radiosonde Y position
dSondeZ	m	double (8)	Radiosonde Z position
fNorth	m	float (4)	Radiosonde north distance from the station position.

This table is continued on the next page.

Table 20 – *Continued from previous page*

Id	Unit	Data type	Description
fEast	m	float (4)	Radiosonde east distance from the station position.
fUp	m	float (4)	Radiosonde up distance from the station position.
fAltitude	m	float (4)	*[blank]*
fGeoPotHeight	gpm	float (4)	Geopotential height.
HDOPpos	?	byte (1), div=10	Horizontal dilution of precision.
VDOPpos	?	byte (1), div=10	Vertical dilution of precision.
wResidualPos	m	unsigned short (2), div=100	Velocity residual.
fVelocityNorth	m/s	float (4)	Radiosonde north velocity.
fVelocityEast	m/s	float (4)	Radiosonde east velocity.
fVelocityUp	m/s	float (4)	Radiosonde up velocity.
fClockDrift	m/s	float (4)	Remote clock drift [s].
wResidualVel	m/s	unsigned short (2), div=100	*[blank]*
StatusReference	?	unsigned short (2)	*[blank]*
StatusRemote	?	unsigned short (2)	*[blank]*
VelStatusReference	?	unsigned short (2)	*[blank]*
VelStatusRemote	?	unsigned short (2)	*[blank]*
OverallStatus	?	unsigned short (2)	*[blank]*
PRN	?	binary (16)	*[blank]*
SatelliteStatus	?	binary (16)	*[blank]*
NumSatsTracked-Remote	?	byte (1)	*[blank]*

This table is continued on the next page.

Table 20 – *Continued from previous page*

Id	Unit	Data type	Description
NumSatsTracked-Reference	?	byte (1)	*[blank]*
NumSatsUsed-Remote	?	byte (1)	*[blank]*
Reserved	?	binary (16)	*[blank]*

B.13 Table "LCPHASE"

The table "LCPHASE" contains raw LORAN-C (Long Range Navigation) phase measurements.

> **Note:** Source of details is section 2.9 "Loran-C Phase Data" of technical document *Vaisala* (2018) on page 13.

Table 21: List of all columns of table "LCPHASE"

Id	Unit	Data type	Description
time	sec, s	short (2)	Time since sounding system time reset
HDOP	?	byte (1)	*[blank]*
MeasuredTime	sec, s	byte (1)	Measured time (default=5 s)
GRI1ArrivalTimeM	?, µs	float (4)	Master arrival time of Gri1
GRI1ArrivalTimeS1	?, µs	float (4)	Secondary 1 arrival time of Gri1
GRI1ArrivalTimeS2	?, µs	float (4)	Secondary 2 arrival time of Gri1
GRI1ArrivalTimeS3	?, µs	float (4)	Secondary 3 arrival time of Gri1
GRI1ArrivalTimeS4	?, µs	float (4)	Secondary 4 arrival time of Gri1
GRI1ArrivalTimeS5	?, µs	float (4)	Secondary 5 arrival time of Gri1
GRI2ArrivalTimeM	?, µs	float (4)	Master arrival time of Gri2
GRI2ArrivalTimeS1	?, µs	float (4)	Secondary 1 arrival time of Gri2
GRI2ArrivalTimeS2	?, µs	float (4)	Secondary 2 arrival time of Gri2
GRI2ArrivalTimeS3	?, µs	float (4)	Secondary 3 arrival time of Gri2
GRI2ArrivalTimeS4	?, µs	float (4)	Secondary 4 arrival time of Gri2
GRI2ArrivalTimeS5	?, µs	float (4)	Secondary 5 arrival time of Gri2

This table is continued on the next page.

Table 21 – *Continued from previous page*

Id	Unit	Data type	Description
GR1AmplitudeM	?	short (2)	Master signal quality of Gri1
GRI1AmplitudeS1	?	short (2)	Secondary 1 signal quality of Gri1
GRI1AmplitudeS2	?	short (2)	Secondary 2 signal quality of Gri1
GRI1AmplitudeS3	?	short (2)	Secondary 3 signal quality of Gri1
GRI1AmplitudeS4	?	short (2)	Secondary 4 signal quality of Gri1
GRI1AmplitudeS5	?	short (2)	Secondary 5 signal quality of Gri1
GRI2AmplitudeM	?	short (2)	Master signal quality of Gri2
GRI2AmplitudeS1	?	short (2)	Secondary 1 signal quality of Gri2
GRI2AmplitudeS2	?	short (2)	Secondary 2 signal quality of Gri2
GRI2AmplitudeS3	?	short (2)	Secondary 3 signal quality of Gri2
GRI2AmplitudeS4	?	short (2)	Secondary 4 signal quality of Gri2
GRI2AmplitudeS5	?	short (2)	Secondary 5 signal quality of Gri2

B.14 Table "LOR_LOC"

The table "LOR_LOC" contains raw LORAN-C (Long Range Navigation) measurements of local antenna at ground station.

Table 22: List of all columns of table "LOR_LOC"

Id	Unit	Data type	Description
time	sec	float (4)	Time since sounding system time reset
GRI1ArrivalTimeM	us	float (4)	*[blank]*
GRI1ArrivalTimeS1	us	float (4)	*[blank]*
GRI1ArrivalTimeS2	us	float (4)	*[blank]*
GRI1ArrivalTimeS3	us	float (4)	*[blank]*
GRI1ArrivalTimeS4	us	float (4)	*[blank]*
GRI1ArrivalTimeS5	us	float (4)	*[blank]*
GRI1NoiseFigureM	0...100	float (4)	*[blank]*
GRI1NoiseFigureS1	0...100	float (4)	*[blank]*
GRI1NoiseFigureS2	0...100	float (4)	*[blank]*

This table is continued on the next page.

Table 22 – *Continued from previous page*

Id	Unit	Data type	Description
GRI1NoiseFigureS3	0...100	float (4)	*[blank]*
GRI1NoiseFigureS4	0...100	float (4)	*[blank]*
GRI1NoiseFigureS5	0...100	float (4)	*[blank]*
GRI2ArrivalTimeM	us	float (4)	*[blank]*
GRI2ArrivalTimeS1	0...100, ?, us	float (4)	*[blank]*
GRI2ArrivalTimeS2	0...100, ?, us	float (4)	*[blank]*
GRI2ArrivalTimeS3	0...100, ?, us	float (4)	*[blank]*
GRI2ArrivalTimeS4	0...100, ?, us	float (4)	*[blank]*
GRI2ArrivalTimeS5	0...100, ?, us	float (4)	*[blank]*
GRI2NoiseFigureM	0...100	float (4)	*[blank]*
GRI2NoiseFigureS1	0...100	float (4)	*[blank]*
GRI2NoiseFigureS2	0...100	float (4)	*[blank]*
GRI2NoiseFigureS3	0...100	float (4)	*[blank]*
GRI2NoiseFigureS4	0...100	float (4)	*[blank]*
GRI2NoiseFigureS5	0...100	float (4)	*[blank]*
HDOP	0...10	float (4)	*[blank]*

B.15 Table “LOR_REM”

The table “LOR_LREM” contains raw LORAN-C (Long Range Navigation) measurements of remote (flying) radiosonde instrument.

Table 23: List of all columns of table “LOR_REM”

Id	Unit	Data type	Description
time	sec	float (4)	Time since sounding system time reset
GRI1ArrivalTimeM	us	float (4)	Master arrival time of Gri1

This table is continued on the next page.

Table 23 – *Continued from previous page*

Id	Unit	Data type	Description
GRI1ArrivalTimeS1	us	float (4)	Secondary 1 arrival time of Gri1
GRI1ArrivalTimeS2	us	float (4)	Secondary 2 arrival time of Gri1
GRI1ArrivalTimeS3	us	float (4)	Secondary 3 arrival time of Gri1
GRI1ArrivalTimeS4	us	float (4)	Secondary 4 arrival time of Gri1
GRI1ArrivalTimeS5	us	float (4)	Secondary 5 arrival time of Gri1
GRI1NoiseFigureM	0...100	float (4)	*[blank]*
GRI1NoiseFigureS1	0...100	float (4)	*[blank]*
GRI1NoiseFigureS2	0...100	float (4)	*[blank]*
GRI1NoiseFigureS3	0...100	float (4)	*[blank]*
GRI1NoiseFigureS4	0...100	float (4)	*[blank]*
GRI1NoiseFigureS5	0...100	float (4)	*[blank]*
GRI2ArrivalTimeM	us	float (4)	Master arrival time of Gri2
GRI2ArrivalTimeS1	0...100, ?, us	float (4)	Secondary 1 arrival time of Gri2
GRI2ArrivalTimeS2	0...100, ?, us	float (4)	Secondary 2 arrival time of Gri2
GRI2ArrivalTimeS3	0...100, ?, us	float (4)	Secondary 3 arrival time of Gri2
GRI2ArrivalTimeS4	0...100, ?, us	float (4)	Secondary 4 arrival time of Gri2
GRI2ArrivalTimeS5	0...100, ?, us	float (4)	Secondary 5 arrival time of Gri2
GRI2NoiseFigureM	0...100	float (4)	*[blank]*
GRI2NoiseFigureS1	0...100	float (4)	*[blank]*
GRI2NoiseFigureS2	0...100	float (4)	*[blank]*
GRI2NoiseFigureS3	0...100	float (4)	*[blank]*
GRI2NoiseFigureS4	0...100	float (4)	*[blank]*
GRI2NoiseFigureS5	0...100	float (4)	*[blank]*
HDOP	0...10	float (4)	*[blank]*

B.16 Table "LOR_STATUS"

The table "LOR_STATUS" contains status information of LORAN-C (Long Range Navigation) measurements.

Table 24: List of all columns of table "LOR_STATUS"

Id	Unit	Data type	Description
time	sec	float (4)	Time since sounding system time reset
GriSelected	?	dword (4)	*[blank]*
Gri_0	?	dword (4)	*[blank]*
Gri_1	?	dword (4)	*[blank]*
Gri_2	?	dword (4)	*[blank]*
Gri_3	?	dword (4)	*[blank]*
GriSynchronized_0	?	dword (4)	*[blank]*
GriSynchronized_1	?	dword (4)	*[blank]*
GriSynchronized_2	?	dword (4)	*[blank]*
GriSynchronized_3	?	dword (4)	*[blank]*
G1_0	sec	float (4)	*[blank]*
G1_1	sec	float (4)	*[blank]*
G1_2	sec	float (4)	*[blank]*
G1_3	sec	float (4)	*[blank]*
G1_4	sec	float (4)	*[blank]*
G1_5	sec	float (4)	*[blank]*
G2_0	sec	float (4)	*[blank]*
G2_1	sec	float (4)	*[blank]*
G2_2	sec	float (4)	*[blank]*
G2_3	sec	float (4)	*[blank]*
G2_4	sec	float (4)	*[blank]*
G2_5	sec	float (4)	*[blank]*
G3_0	sec	float (4)	*[blank]*
G3_1	sec	float (4)	*[blank]*
G3_2	sec	float (4)	*[blank]*

This table is continued on the next page.

Table 24 – *Continued from previous page*

Id	Unit	Data type	Description
G3_3	sec	float (4)	*[blank]*
G3_4	sec	float (4)	*[blank]*
G3_5	sec	float (4)	*[blank]*
G4_0	sec	float (4)	*[blank]*
G4_1	sec	float (4)	*[blank]*
G4_2	sec	float (4)	*[blank]*
G4_3	sec	float (4)	*[blank]*
G4_4	sec	float (4)	*[blank]*
G4_5	sec	float (4)	*[blank]*
DopCombination_0	sec	float (4)	*[blank]*
DopCombination_1	sec	float (4)	*[blank]*
DopCombination_2	sec	float (4)	*[blank]*
DopCombination_3	sec	float (4)	*[blank]*
DopCombination_4	sec	float (4)	*[blank]*
DopCombination_5	sec	float (4)	*[blank]*

B.17 Table "RAD_STATUS"

The table "RAD_STATUS" contains status information of radio receiver.

Table 25: List of all columns of table "RAD_STATUS"

Id	Unit	Data type	Description
time	sec	float (4)	Time since sounding system time reset
Status_1		byte (1)	*[blank]*
Status_2		byte (1)	*[blank]*
RF_Level		byte (1)	*[blank]*
PadByte1		byte (1)	*[blank]*
ReceiverFreq		float (4)	*[blank]*
Azimuth		byte (1)	*[blank]*

This table is continued on the next page.

Table 25 – *Continued from previous page*

Id	Unit	Data type	Description
Elevation		byte (1)	*[blank]*
PadByte2		byte (1)	*[blank]*
PadByte3		byte (1)	*[blank]*

B.18 Table "RADIOLOG"

The table "RADIOLOG" contains radio log of UPP210 only.

Table 26: List of all columns of table "RADIOLOG"

Id	Unit	Data type	Description
byte	char	byte (1)	*[blank]*

B.19 Table "RS92SONDEID"

The table "RS92SONDEID" contains identification frames of RS92 radiosonde instruments including the unique serial number of flying radiosonde.

Table 27: List of all columns of table "RS92SONDEID"

Id	Unit	Data type	Description
time	sec	float (4)	Time since sounding system time reset
FrameCounter	sec	unsigned short (2)	*[blank]*
SondeSerialNumber	?	binary (10)	Serial number of sonde
DiagByte1	?	byte (1)	*[blank]*
DiagByte2	?	byte (1)	*[blank]*
Reserved	?	byte (1)	*[blank]*
KillerTime	sec	unsigned short (2)	*[blank]*
EepromBlkCounter	?	byte (1)	*[blank]*
MaxEepromBlocks	?	byte (1)	*[blank]*

B.20 Table "RSSTATUS"

The table "RSSTATUS" contains status information of received radiosonde signal.

Table 28: List of all columns of table "RSSTATUS"

Id	Unit	Data type	Description
time	s	float (4)	Time since sounding system time reset
size	UINT32	dword (4)	*[blank]*
synch	bits	dword (4)	*[blank]*
freq	Hz	float (4)	*[blank]*
AfcCorr	Hz	float (4)	*[blank]*
Peak	dB	float (4)	*[blank]*
Noise	dB	float (4)	*[blank]*
SignPower	dB	float (4)	*[blank]*
NoisePower	dB	float (4)	*[blank]*
SNR	ratio	float (4)	*[blank]*
TotCnt	nr	dword (4)	*[blank]*
FrameCnt	nr	dword (4)	*[blank]*
CRCErrCnt	nr	dword (4)	*[blank]*
MissCnt	nr	dword (4)	*[blank]*
BitCnt	nr	dword (4)	*[blank]*
BitErrCnt	nr	dword (4)	*[blank]*
DiagWord	UINT32	dword (4)	*[blank]*
AntType	enum	dword (4)	*[blank]*
AntMode	enum	dword (4)	*[blank]*
AntDir	enum	dword (4)	*[blank]*
AntPower	enum	dword (4)	*[blank]*

B.21 Table "SENS8FRQ"

The table "SENS8FRQ" contains raw measurement frequencies of PTU sensors (pressure, temperature, humidity) of a RS80 radiosonde.

Table 29: List of all columns of table “SENS8FRQ”

Id	Unit	Data type	Description
time	sec	float (4)	Time since sounding system time reset
fS	Hz	float (4)	*[blank]*
fP	Hz	float (4)	*[blank]*
fK2	Hz	float (4)	*[blank]*
fT	Hz	float (4)	*[blank]*
fU	Hz	float (4)	*[blank]*
fK1	Hz	float (4)	*[blank]*

B.22 Table “SENS9FRQ”

The table “SENS9FRQ” contains raw measurement frequencies of PTU sensors (pressure, temperature, humidity) of a RS90, RS91 or RS92 radiosonde.

Table 30: List of all columns of table “SENS9FRQ”

Id	Unit	Data type	Description
time	sec	float (4)	Time, Time since sounding system time reset
fT	Hz	float (4)	*[blank]*
fU1	Hz	float (4)	*[blank]*
fU2	Hz	float (4)	*[blank]*
fK2	Hz	float (4)	*[blank]*
fS	Hz	float (4)	*[blank]*
fP	Hz	float (4)	*[blank]*
fK3	Hz	float (4)	*[blank]*
fK1	Hz	float (4)	*[blank]*

B.23 Table “SPECSENSORS”

The table “SPECSENSORS” contains measurement data of linked specific (additional) sensors, e.g. ozone sonde or radioactivity sonde.

Table 31: List of all columns of table “SPECSENSORS”

Id	Unit	Data type	Description
time	sec, s	float (4)	Time, Time since sounding system time reset
length	?	byte (1)	*[blank]*
specdata	?	binary (40)	Special sensor data, sensor dependent

B.23.1 Raw ozone data

```
01 - 04 Uncalibrated reading of sensor channel 1, for ozone temperature
05 - 08 Uncalibrated reading of sensor channel 2, for ozone temperature
09 - 12 Uncalibrated reading of sensor channel 3, for ozone temperature
13 - 16 Uncalibrated reading of sensor channel 4, for ozone temperature
17 - 20 Uncalibrated reading of sensor channel 5, for the interface board
21 - 24 Uncalibrated reading of sensor channel 6, for ozone cell current
25 - 28 Uncalibrated reading of sensor channel 7, for ozone cell current
29 - 32 Uncalibrated reading of sensor channel 8, for the interface board
33 - 36 Number of cycles received
37 - 40 Not used
```

B.23.2 Raw radioactivity data

```
01 - 04 Count of tube1 (beta) during one PTU cycle
05 - 08 Count of tube2 (gamma) during one PTU cycle
09 - 12 Number of radioactivity cycles received during one PTU cycle
13 - 40 Not used
```

B.24 Tables “STD” and “FLSTD”

This table can be available at two different positions in the DC3DB file: as real data base table “STD” or as internal dump file “FLTD”. Also these tables have equal structure like “EDT” and “FLEDT”. (see Section B.3)

Note: Source of details is section 2.2 “Edited Data” of technical document *Vaisala* (2018) on page 7.

Table 32: List of all columns of table “FLSTD”

Id	Unit	Data type	Description
time	sec	float (4)	Time, Elapsed time since sonde release

This table is continued on the next page.

Table 32 – *Continued from previous page*

Id	Unit	Data type	Description
Pscl	ln scaled	float (4)	Scaled logarithmic pressure, $4096 * \ln P$ hPa
T	K	float (4)	Temperature
RH	%	float (4)	Humidity
v	m/s	float (4), div=-1	North component of wind, Positive when flow from North
u	m/s	float (4), div=-1	East component of wind, Positive when flow from East
Height	m	float (4)	Altitude above mean sea level
P	hPa	float (4)	Pressure
TD	K	float (4)	Dew point temperature
MR	g/kg	float (4)	Mixing ratio
DD	dgr	float (4)	Wind direction
FF	m/s	float (4)	Wind speed
AZ	dgr	float (4)	Azimuth to the sonde
El	dgr	float (4)	Elevation to the sonde
Range	m	float (4)	Horizontal distance to the sonde
Lon	dgr	float (4)	Sonde position longitude
Lat	dgr	float (4)	Sonde position latitude
SpuKey	bitfield	unsigned short (2)	SOND calculated significance key, see section B.3
UsrKey	bitfield	unsigned short (2)	User edited/recalculated significance key, see section B.3
RadarH	m	float (4)	Radar height

Acronyms

DC3DB Vaisala DigiCORA® 3 DataBase File

GRUAN GCOS Upper-Air Network

References

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Vaisala, *Sounding Data File Formats for PC-based Systems*, Vaisala Oyi, P.O. Box 26 FIN-00421 Helsinki Finland, 2018, document number Files-T591en-1.3 (1998-03-18).