Technical Documentation

Setup of OTT Protocol - Binary

Notation

```
bx    Bit
Tx    Tetrade = 4 Bits
Bx    Byte = 2 Tetrades = 8 Bits
Px    Byte coded in pseudo-binary (6 Bits of useful content; 3Fh – 7Eh)
(x = value)

Transmission direction from left to right (the lowest Bit, Byte value first)
```

Type Definitions (Basis)

General

OTT ID 2 Byte OT
B0 B1 2 ASCII characters "OT" as an identifier for OTT data sets

Data block type definition: 1 Byte main-type code and 1 Byte sub-type code

Main-type: **0** = OTT-COM (SKA...); Project Paraguay
Sub-types: 0 = Self-Timed-Transmission data block
1 = Interrogate data block (current data)
2 = Alarm data block (random)
3 = ...

Main-type: **1** = LogoSens GOES data transmission
Sub-types: 0 = Self-Timed-Transmission data block
1 = ... (future customer-specific formats)

Main-type: **10** = LogoSens SMS transmission
Sub-types: 0 = Standard transmission (own definition)
1 = ... (future customer-specific formats)

Data type / coding:
00 = 12 Bit-coded measured value without time
01 = 12 Bit-coded measured value + 12 Bit-coded times added
02 = 16 Bit-coded measured value without time
...
11 = 12 Bit-coded measured value with time, type of limit and limit
...

Date/Time in seconds since 01.01.2000 00:00:00
B0 B1 B2 B3 4Byte long (unsigned); lasts for 136 years

Tetrade coding (12-Bit; type 0)

Measured value, 12 Bit (3 tetrades)
T0 T1 T2 1.5 Bytes, value range 0...4080 or -2032...+2047;
amount shown with +/- sign (11 Bits + 1 sign);
the values –2032(4080) to –2047(4095) are used to
code the measured value error

Time, 12 Bits (3 tetrades)
T0 T1 T2 1.5 Bytes, value range 0...1440 in minutes beginning at
00:00

Sensor number 12 Bits (Transducer No.)
T0 T1 T2 1.5 Bytes
Bit 0...9: Number (10 Bit integer) 1...999(1020) (avoid >FFC !)
.
Bit 10: 0 = unipolar measured value representation (0...4080)
1 = bipolar measured value representation (-2032...+2047)
Bit 11: x (0 = measured value only (no time)
1 = measured value with time)

End Of Block (EOB) 12 Bit special code
T0 T1 T2 FFE hex

End Of Transmission (EOT) 12 Bit special code
T0 T1 T2 FFE hex

Station number (identifier)
B0 B1 B2 B3 4 Bytes long; for a max. of 9,5-digit purely numerical station ID;

Note on 12 Bit values:
If the number of values is odd in the case of multiple values, the subsequent (last) tetrade is undefined!

SMS type 10 Byte coding

Station number (identifier)
B0 – B9 10 char alphanumeric;

Sensor number (Transducer No.)
B0 – B3 4 char alphanumeric

Measured value
B0 – B3 4 byte float

STX Start of Text
0x02

ETX End of Text
0x03

Type 00 Data Block Setup

Setup description of data blocks for OTT-COM -Inmarsat-C outside station
Breyer; status: 12.01.2005

1. Self- Timed Reporting Mode.
2. Random Reporting Mode.
3. Interrogate Reporting Mode.

To transmit data via satellite, the data should be presented in a form as economical as possible.
Almost all data are coded in Bytes (8 Bits) in binary form; individual values and their times are (can be) coded in tetrades (4 Bits) if necessary.

Command

A command consists of the OTT identifier and the data block type (2+2 Bytes):

B0 B1	OT	OTT ID; 2 Bytes
B0 B1	00hex	e.g. OTT-COM (SKA...); Project Paraguay
	01hex	e.g. Interrogate data block

Type 0x00/0x00 data block setup: Self-Timed-Transmission N sensors - 1 value

Most compact representation for maximum economy of data volume.
Only one value without time is transmitted for each of any number of sensors/transducers/channels; the same time applies for all values (in the header).
The determination of which values are the instantaneous values, last saved values, means or totals is left up to the software in the device.
For this block type, the sensor and the measured value representation must be exactly defined at the recipient for each individual value.

Header field

B0 B1	OT	OTT ID; 2 Bytes
B0 B1	00hex	OTT-COM (SKA...); Project Paraguay
	00hex	Self-Timed-Transmission data block
B0 B1 B2 B3	0...FFFFFFFFhex station; 4 Bytes	Station number of the transmitting
B0 B1 B2 B3	Date/Time; 4 Bytes	
B0	00hex	Data type 12 Bit measured value (without time)

Data field: N entries

T0 T1 T2	000...FFChex	1...Nth measured value

Type 0x00/0x01 data block setup: Interrogate data N sensors - 1 value

Only one value with the time is transmitted for each of any number of sensors/transducers/channels; the same date applies for all values (time of the header; if the time is 00:00, the value must be dated to 24:00 of the previous day).
The determination of which values are the instantaneous values or means, or last saved values is left up to the software in the device.

Header field		
B0 B1	OT	OTT ID; 2 Bytes
B0 B1	00hex 01hex	OTT-COM (SKA...); Project Paraguay Interrogate data block
B0 B1 B2 B3	0...FFFFFFFFhex station; 4 Bytes	Station number of the transmitting
B0 B1 B2 B3	Date/Time; 4 Bytes	
B0	01hex	Data type 12 Bit measured value with time
Data field: N entries		
T0 T1 T2	XXX	1...Nth sensor No.
T0 T1 T2	000...FFChex	1...Nth measured value
T0 T1 T2	000...5A0hex	1...Nth time
T0 T1 T2	FFF	EOT; End of block

Type 0x00/0x02 data block setup: Alarm data (random) 1 sensors - 1 alarm

Only one alarm with value, time, type of limit and limit value is transmitted; the date of the header and the time of measurement applies.

Header field		
B0 B1	OT	OTT ID; 2 Bytes
B0 B1	00hex 02hex	OTT-COM (SKA...); Project Paraguay Alarm data block
B0 B1 B2 B3	0...FFFFFFFFhex station; 4 Bytes	Station number of the transmitting
B0 B1 B2 B3	Date/Time; 4 Bytes	
B0	11hex	Data type 12 Bit measured value with time, type of limit (code) and limit value
Data field: 1 Entry		
T0 T1 T2	XXX	Sensor No.
T0 T1 T2	000...FFChex	Measured value (triggering value)
T0 T1 T2	000...5A0hex	Time of trigger
T0 T1 T2	XXX	Type of limit (code) (see OTT Protocol K52)
T0 T1 T2	000...FFC	Limit value (see OTT Protocol K52)

Subsequently (optional):

Data field: 1 entry with 1 sensor no. and 1 measured value (without time)

T0 T1 T2	XXX	Sensor No.
T0 T1 T2	000...FFChex	Measured value (wind direction)

T0 T1 T2	FFF	EOT; End of block

Type 0x01 Data Block Setup

Type "*A@*" data block setup: Self-Timed-Transmission N sensors - M values (pseudobinary)

(defined for OTT-DCP protocol for pseudobinary data transmission)
Time series (with 1 - M values) are transmitted for 1 – N sensors.
The first 4 characters of the header field must be interpreted as pseudobinary.
All other characters (rest of header + sensor data) are originally coded as binary and then converted to 6-bit pseudobinary (4 characters from 3 Bytes).

Data setup

Header field		
P0 P1	OT	OTT ID; 2 Bytes (pseudo-binary)
P0 P1	41hex	LogoSens OTT DCP protocol (pseudo-binary)
	40hex	Self timed transmission (pseudo-binary)
P0 – PX	! From here on, all Bytes must be converted from pseudo-binary to binary.	

Now as to the binary setup:

B0 – B3	Time of transmission (Date/Time), 4 Bytes, seconds since 1.1.2000 From this, the time stamp of the measured values is determined together with the interval (see below).

Sensor data (N times)

Periodic sensor data field: M value entries

B0 – B1	Interval of measured values (<> 0 = periodic) in minutes; the uppermost Bit(16) codes the value range of the measured values: Bit 16 = 1: unsigned (unipolar) / = 0: signed (bipolar = +-32767)
B0 – B1	Number (M) of sequential measured value entries
M times	
B0 – B1	Measured value, 2 Bytes int / word

Aperiodic sensor data field: M value entries + time

B0 – B1	Interval of measured values = 0 = aperiodic; the uppermost Bit(16) codes the value range of the measured values: Bit 16 = 1: unsigned (unipolar) / = 0: signed(bipolar = +-32767)
B0 – B1	Number (M) of sequential measured value entries
M times	
B0 – B1	Measured value, 2 Bytes int / word
B0 – B3	Date / Time = 4 Bytes (seconds since 1.1.2000)

Example of a generated string:

```
OTA@Xj\dK@@@L@PXH`WoQnpXHPjoQnPWH@}oQnPWHpOpQnPXH`bpQnpWHPupQn`XH@HqQn`XHpZqQ
nPXH`mqQn`WHP@rQnPWH@SrQnPWHperQnPA@p@@WCpu@XM@VC`u@XM@WCpu@\M@VC`u@XM@@@XC@@
@@Lq[dK@@@xu[dK@@@dz[dK@@@P?[dK@@@|C\dK@@@hH\dK@@@TM\dK@@@@R\dK@@@lV\dK@@@X[\
dK@@@D`\dK@@@pd\dK@@@\i\dK@H@
```

Note:
All other information
- Station number (Station ID)

- Sequence of sensors and their numbers (channel ID)
- The number of significant digits after the decimal for the measured value must already be separately known.

Type “11“ data block setup: Self-Timed-Transmission N sensors - M values (ASCII)

(defined for OTT-DCP protocol for data transmission in IA5 (ASCII) format)
Time series (with 1 - M values) are transmitted for 1 – N sensors.
The first 4 characters are the identifier of the protocol.
All other values (sensor data) are shown in ASCII.

Data setup

```
Header field
B0 B1          OT              OTT ID; 2 Bytes

B0 B1          31hex           LogoSens OTT DCP IA5 Protocol)
               31hex           Self timed transmission (IA5)

All subsequent data are numeric ASCII strings, the field sizes indicated are
maximum values. Blanks are used as separators between values.

B0 – B9        Time of transmission (Date/Time), max. 10 Bytes, seconds since
               1.1.2000
               From this, the time stamp of the measured value is
               determined together with the interval (see below).

Sensor data (N times)

Periodic sensor data field: M value entries
B0 – B4        Interval of measured values (<> 0 = periodic) in minutes;
               Bit 15 = 1 positive only
B0 – B2        Number (M) of sequential measured value entries
M times
B0 – B5        Measured value, 6 Bytes ASCII with sign

Aperiodic sensor data field: M value entries + time
B0 – B4        Interval of measured values = 0 = aperiodic;
               Bit 15 = 1 positive only
B0 – B1        Number (M) of sequential measured value entries
M times
B0 – B5        Measured value, 2 Bytes int / word
B0 – B9        Time stored, 10 Bytes (seconds since 1.1.2000)


Example of a generated string:

OT11194085720 5 012 2039 2039 2004 2012 2030 -32758 -32758 -32758 -32758 -
32758 -32758 -32758 5 012 204 204 201 201 203 -32758 -32758 -32758 -32758 -
32758 -32758 -32758 32768 006 0 194082000 0 194082300 0 194082600 0 194082900
0 194083200 0 194083500

Note:
All other information
   - Station number (Station ID)
   - Sequence of sensors and their numbers (channel ID)
   - The number of significant digits after the decimal for the measured
     value must already be separately known.
```

Type 0x0A Data Block Setup

Type 0x0A/0x00 data block setup: Standard transmission (SMS, X.31, GPRS)

Time series (1 - M values) are transmitted for 1 – N sensors.
A maximum of 140 Bytes per data block can be produced.
All data are coded in Hex-ASCII

Header field

B0 B1	OT	OTT ID; 2 Bytes In container: 2 Byte length	0
B0 B1	0Ahex 00hex	LogoSens SMS etc. transmission Standard transmission	2
B0 – B9	Station number of the transmitting station; 10 Bytes		4

Sensor data field: N periodic entries

B0	SOH (01)	14
B0	Length of the subsequent sensor block in Bytes	15
B0 – B3	Sensor No. , 4 Bytes	16
B0	Bit 0 unsigned (1) / signed (0) Bit 1- 3 digits after the decimal 0 -7	20
B0 – B2	Interval, 3 Bytes	21
B0 – B3	Start time of 1st measured value, 4 Bytes (seconds since 1.1.2000)	24

n times

B0 – B1	Measured value, 2 Bytes int / word	28

Sensor data field: N aperiodic entries

B0	STX (02)	14
B0	Length of the subsequent sensor block in Bytes	15
B0 – B3	Sensor No. , 4 Bytes	16
B0	Bit 0 unsigned (1) / signed (0) Bit 1- 3 digits after the decimal 0 -7	20

n times

B0 – B1	Measured value, 2 Bytes int / word
B0 – B3	Date/Time 4 Bytes

Daily Minimum / Maximum

B0	ID for Minimum/Maximum: EOT (03)
B0	Length of following data (fixed 0x11)
B0 – B3	Sensor ID. , 4 Byte
B0	Bit 0 unsigned (1) / signed (0) Bit 1- 3 Decimal Places 0 -7
B0 – B1	Minimum Value, 2 Byte int / word
B0 – B3	Minimum Date / Time 4 Byte
B0 – B1	Maximum Value, 2 Byte int / word
B0 – B3	Date Maximum / Time 4 Byte

At the end of the data block is 0x00.

Type 0x0A/0x01 data block setup: same as 0x0A/0x00 max. 65535 Bytes/sensor

Time series (1 - M values) are transmitted for 1 – N sensors.
A maximum of 32 kBytes per data block can be produced.
All data are coded in Hex-ASCII

Header field

B0 B1	OT	OTT ID; 2 Bytes In container: 2 Byte length	0
B0 B1	0Ahex 01hex	LogoSens transmission Extended transmission	2
B0 – B8	Station number of the transmitting station; 10 Bytes		4

Sensor data field: N periodic entries

B0	SOH (01)	14
B0 B1	Length of the subsequent sensor block in Bytes	15
B0 – B3	Sensor No. , 4 Bytes	17
B0	Bit 0 unsigned (1) / signed (0) Bit 1- 3 digits after the decimal 0 -7	21
B0 – B2	Interval, 3 Bytes	22
B0 – B3	Start time of 1st measured value, 4 Bytes (seconds since 1.1.2000)	25

n times

B0 – B1	Measured value, 2 Bytes int / word	29

Sensor data field: N aperiodic entries

B0	STX (02)	14
B0 B1	Length of the subsequent sensor block in Bytes	15
B0 – B3	Sensor No. , 4 Bytes	17
B0	Bit 0 unsigned (1) / signed (0) Bit 1- 3 digits after the decimal 0 -7	21

n times

B0 – B1	Measured value, 2 Bytes int / word
B0 – B3	Date/Time 4 Bytes

Daily Minimum / Maximum

B0	ID for Minimum/Maximum: EOT (03)
B0 B1	Length of following data (fixed 0x11)
B0 – B3	Sensor ID. , 4 Byte
B0	Bit 0 unsigned (1) / signed (0) Bit 1- 3 Decimal Places 0 -7
B0 – B1	Minimum Value, 2 Byte int / word
B0 – B3	Minimum Date / Time 4 Byte
B0 – B1	Maximum Value, 2 Byte int / word
B0 – B3	Date Maximum / Time 4 Byte

At the end of the data block is 0x00.

Transmission example

The left part of the logged transmission shows the bytes inhexadecimal notation.
On the right, there are the ASCII equivalent (non printable character are replaced by a dot)

With modem messages

```
0D 0A 52 49 4E 47 0D 0A   0D 0A 43 4F 4E 4E 45 43      ..RING.. ..CONNEC
54 20 39 36 30 30 0D 0A   4F 54 0A 00 30 30 30 30      T 9600.. OT..0000
30 31 32 33 34 35 01 16   30 30 31 30 01 3C 00 00      012345.. 0010.<..
58 1E 06 0B F2 FF F2 FF   F2 FF F2 FF F2 FF 01 16      X...= =  = = = ..
32 32 32 32 01 3C 00 00   58 1E 06 0B F2 FF F2 FF      2222.<.. X...= =
F2 FF F2 FF F2 FF 00 0D   0A 4E 4F 20 43 41 52 52      = = = .. .NO CARR
49 45 52 0D 0A                                         IER..
```

only content ofIt Ott binary type 10 / 00 (red)

```
54 20 39 36 30 30 0D 0A   4F 54 0A 00 30 30 30 30      T 9600.. OT..0000
30 31 32 33 34 35 01 16   30 30 31 30 01 3C 00 00      012345.. 0010.<..
58 1E 06 0B F2 FF F2 FF   F2 FF F2 FF F2 FF 01 16      X...= =  = = = ..
32 32 32 32 01 3C 00 00   58 1E 06 0B F2 FF F2 FF      2222.<.. X...= =
F2 FF F2 FF F2 FF 00 0D   0A 4E 4F 20 43 41 52 52      = = = .. .NO CARR
```

Type 0x20 (Info data) data block setup

Type 0x20/0x01 data block setup: Observer entry

Observer data within a time frame are transmitted
A maximum of 32 kBytes per data block can be produced.

Header field

B0 B1	OT	OTT ID; 2 Bytes In container: 2 Byte length	0
B0 B1	20hex 01hex	LogoSens Info data Observer entry	2
B0 – B8	Station number of transmitting station; 10 Bytes		4

Observer data observer activated
B0 0x01
B0 – B3 Date/Time

Observer data Offset setting
B0 0x02
B0 – B3 Date/Time
B0 – B3 Sensor No. , 4 Bytes
B0 Offset parameter changed 0 = no, 1 = yes
B0 – B3 Measured value prior to change (float)
B0 – B3 Measured value after change (float)

Observer data notification
B0 0x03
B0 – B3 Date/Time
B0 – B3 Sensor No. (ASCII) sensor No. 0000 = measurement station
B0 – B3 Notification No. (ASCII)
B0 Length of string (0 = no string)
if necessary
B0 - string (max. 255)

At the end of the data block is 0x00.

Type 0x21 Data Block Setup

Type 0x21/0x01 data block setup: Limit

The alarm of a sensor is transmitted

Header field

B0 B1	OT	OTT ID; 2 Bytes In container: 2 Byte length	0
B0 B1	21hex 01hex	Alarm Sensor	2
B0 – B9	Station number of transmitting station; 10 Bytes		4
B0 – B3	Sensor No. , 4 Bytes		
B0 – B3	Date/Time		
B0 – B3	Measured value (limit trigger) float		
B0 – B3	Limit float		
B0	Type of limit infringement U = up, D = Down, G = Gradient, T = Test, E = Error, S = Status		
B0	Limit infringement start / end S = Start, E = End		

Error coding for floating measured value:
if error, measured value is 100000 + OTT protocol error code

Type 0x30 control block setup (to datalogger)

Type 0x30/0x01 control block setup: Time setting

The time (date/time) to be set by the datalogger is transmitted

Header field

B0 B1	OT	OTT ID; 2 Bytes In container: 2 Byte length	0
B0 B1	30hex 01hex	Datalogger control Time setting	2
B0 – B3	Date/Time		

Type 0x30/0x02 control block setup: Receipt readiness (extraordinary time window)

Time at which the datalogger is ready to receive (Timeout ? 1 minute)

Header field

B0 B1	OT	OTT ID; 2 Bytes In container: 2 Byte length	0
B0 B1	30hex 02hex	Datalogger control Receipt readiness	2
B0 – B3 B0 – B3	Date/time of the start activation Date/time of the end activation 0 = no datalogger controlled end		

Type 0x30/0x03 control block setup: Logger control

Changes the state of the logger.

Header field

B0 B1	OT	OTT ID; 2 Bytes In container: 2 Byte length	0
B0 B1	30hex 03hex	Datalogger control State change	2
B0	01 = Standard communication (Cl/OTT Prot., etc.) 02 = End communication (relay off, etc.)		

Type 0x30/0x04 control block setup: End readiness of X-modem

Switches upon readiness for above control commands
Not recognized in the container

Header field

B0 B1	OT	OTT ID; 2 Bytes In container: 2 Byte length	0
B0 B1	30hex 04hex	Datalogger control End of communication	2

Type 0x31 control block setup (from/to datalogger)

Type 0x31/0x01 control block setup: Readiness of X-modem

Signals that a container is ready for transmission via X-modem.

In order to accomplish X-modem secured transmissions.

Header field

B0 B1	OT	OTT ID; 2 Bytes In container: 2 Byte length	0
B0 B1	31hex 01hex	Control center Readiness	2

Type 0x40 data block setup (to datalogger)

Type 0x40/0x01 data block setup: Configuration data

Header field

B0 B1	OT	OTT ID; 2 Bytes	0
B0 B1 01hex	40hex	Configuration	2

B0	Configuration type 0 = delete configuration with data 1 = delete configuration without data (service) 2 = Set parameters
B0 – B7	Password, 8 Bytes (alphanumeric)
B0 – Bx	Configuration data

Type 0xF0 container setup

Contains defined data blocks.
The OT ID of the data/control blocks is replaced by the length of the block.

Header field

B0 B1	OT	OTT ID; 2 Bytes
B0 B1	F0hex	Container
	00hex	Standard
B0 B1	Length	Container (max 32kB)

CRC16 from here on

B0 – B3	"0000" Container ID; 4 Bytes const alphanumeric
B0 – B3	ulong current time
B0 – B1	Timeslot length in seconds
B0	01hex number of container blocks const (max. 255)
B0	01hex block counter const
B0	Control to recipient (transmission controls) as sender: 0x01 ACK/NAK transmission (const) 0x00 no acknowledgement
B0	Control to sender (recipient controls) As recipient: 0x00 ACK ; 0x01 NAK
B0 – Bx	Container contents (0 –n OTT binary protocol types)
B0 B1	0x0000 zero length (all contents contain the length in the first 2 Bytes)
B0 B1	CRC 16 B0 = High Byte from CRC (same as X-modem)

Container Protocol Description

Acknowledgement operation:
Determination of control parameters:
- Timeout for ACK (in seconds)
- Number of repetitions in case of error

The acknowledgement of the container (in the container header) will (can) be requested by the sender.
This determines how the sender reacts individually.
Definition of sender:

tbd