ESG-Logger-LOAD

Technical specifications

Object	*The aim of this document is to present the complete ESG-Logger-LOAD technical specifications.* *That includes the features descriptions, the commands supported, the complete set of parameters and the spontaneous frames format.* *WARNING: Document writing in progress.*

Summary

Revisions

Version	Date	Contributor(s)	Changes
1	15/05/2023	MDD	First release of ESG-LOGGER-LC technical documentation

Reference Documents

Ref.	Titre	Designation
[DR01]		

Compatible firmware

Firmware number	Minimum firmware version
2C33	01.07.02

1 Main features

ESG-LOGGER-LC is designed to weigh your materials or your goods to ensure good replenishment tracking, help you with your inventory management and much more.

ESG-LOGGER-LC offers different operating modes:
- Sending the weight periodically
- Alert in case of weight difference measurement (stock movement and kitting)
- Sending an alert when a threshold is reached (stock control)

1.1 Behaviour

ESG-LOGGER-LC can send alert frames and periodic frames containing the weight and various information depending on the use case.

1.2 Type of ESG-LOGGER-LC

The 4 sizes of scales

- ESG-INO-LC015S-X89-510 ESG-Logger-LC Weighing table - 15 kg 35x21cm - 868/915 - IP54
- ESG-INO-LC050S-X89-510 ESG-Logger-LC Weighing table - 50 kg 35x21cm - 868/915 - IP54
- ESG-INO-LC015L-X89-510 ESG-Logger-LC Weighing table - 15 kg 50x31cm - 868/915 - IP54
- ESG-INO-LC050L-X89-510 ESG-Logger-LC Weighing table - 50 kg 50x31cm - 868/915 - IP54

2 Configuration

2.1 Défault settings

LoRaWAN settings

LoRaWAN Class	**A**
LoRaWAN Mode	**Public**
Activation	**OTAA**
ADR	**Active**
DutyCycle	**Inactive**
Tx Power	**14dB**

Functional settings

Event frame format	**Standard**
Periodic picture	**Standard every 4h**
Keep alive period	**Standard every 72h**
Sensors mode source 1	**WEIGHING**
Sensors mode source 2	**Disabled**

2.2 Main configuration frame by LoRaWAN Downlink Command

⚠ **LoRaWAN downlinks commands are always on port #1**

2.2.1 Send TARE to device

If you want to perform a new TARE you have to send this downlink to the device on port #1

Request :
38090000000000000000
Response :
B80900

2.2.2 Direct weight reading

You can request an immediate weight reading :
Request :
3709
Response :
B709000000FFFFFFFF

Decomposition :

B709 : Frame header
00 : Read succes
0000 : Weight in g (on 2 Bytes)
FFFFFFFF : Not used

2.2.3 Blinking LED device

To identify the device, you can send a blinking command.

Request :

02000000000000A000201320202320202FF000000FF00

0A : Blink time (default : 10sec)

2.2.4 Parameter changes

Request :

0401DF0804003C000002000A

04 : Write parameter
01 : Number of parameter
DF : Parameter's name
08 : Parameter's length
04003C000002000A : Data

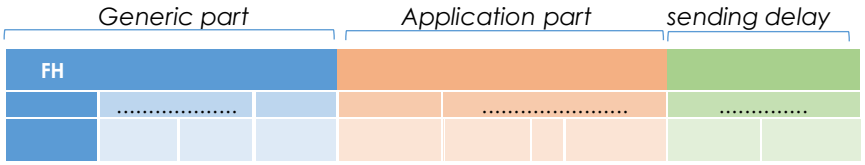
Response :

8401DF0800

00 : Parameter write succes

3 Spontaneous frames

All spontaneous frames are colored the same way to identify 2 different parts in the frame:



3.1 Event frames

REMINDER ***Allocated frame headers are 0x68, 0x69, 0x6A and 0x6B.***
The first 3 will be used for respectively short, standard and long frame type.
The forth one is available for any other special event frame format.
A device can support only some of these frame types, according to its specifications.

See Event frame feature and sending mechanisms in section **Erreur ! Source du renvoi introuvable.**.

This is a guide line. If required, one or more registers can be inserted, but taking care to do not rework the frame structure.

3.1.1 [0x68] – Short event frame

Frame format

FH	STATUS		TEMP	EVT_TYPE	EVT_DATA	OTOTx_info	
0	1 2		3	4	…	…	
0x68	MSB	LSB				MSB	LSB

STATUS.....Status of the device and basic frame counter:

b15-12 are a basic spontaneous frame counter that overlaps each 16 spontaneous frame generated. This is typically used to detect frame repetition on system level.

b11-0. are a copy of the same bits of parameter DEV_STAT

TEMP.....Last measured temperature. Two's complemented signed byte formatted. Expressed in [degree Celsius]

EVT_TYPE.....Enumeration of event types. See the description table below.

EVT_TYPE	Description	EVT_DATA
0x01	High operating temperature alert	TEMP_DATA
0x02	Low operating temperature alert	
0x03	Operating temperature returned to normal range	
0x81	High application temperature alert	
0x82	Low application temperature alert	
0x83	Application temperature returned to normal range	
0x84	Application temperature sensor issue	
0x85	High application hygrometry alert	HYGRO_DATA
0x86	Low application hygrometry alert	
0x87	Application hygrometry returned to normal range	
0x88	Application hygrometry sensor issue	
0x89	State changed on source 1	SRC_DATA
0x8A	State changed on source 2	
0x8B	References initialized	REF_DATA
0x8C	Counters reset	CTR_RST_DATA
0x8D	Data error on source x	ERR_DATA

EVT_DATA.....Data related to the event. See the description table below.

TEMP_DATA – Size 4 bytes		
Byte 1 – Byte 4		
MSB	…	LSB
Temperature value expressed in 1/256th degree Celsius, Two's complemented		

HYGRO_DATA – Size 4 bytes		
Byte 1 – Byte 4		
MSB	…	LSB
Hygrometry value expressed in 1/256th %		

SRC_DATA – Size 4 bytes			
Byte 1	Byte 2 – Byte 4		
	MSB	…	LSB
b7-4: Previous state b3-0: New state	Counter of new state detections for given source on 3 bytes		

REF_DATA – Size 3 bytes		
Byte 1	Byte 2 – Byte 3	
	MSB	LSB
b7-4: Source 1 configuration b3-0: Source 2 configuration	References initialized as defined in (0x34) – Start references initialization	

CTR_RST_DATA – Size 1 byte	
b7-4	b3-0
Source 1 configuration	Source 2 configuration

ERR_DATA – Size 2 bytes	
Byte 1	Byte 2
b7-4: Source 1 configuration b3-0: Source 2 configuration	Source that triggered the error

OTOTx_info.....Time between the moment the frame is generated and the moment of sending [expressed in seconds]
Occupies always the last 2 bytes in this type of frame
Thus, event calculated timestamp is: `reception time – OTOTx_delay`

3.1.2 [0x69] – Standard event frame

Frame format

FH	STATUS		TEMP	EVT_TYPE	EVT_DATA	OTOTx_info	
0	1 2		3	4	…	…	
0x69	MSB	LSB				MSB	LSB

STATUS.....Status of the device and basic frame counter:

b15-12 are a basic spontaneous frame counter that overlaps each 16 spontaneous frame generated. This is typically used to detect frame repetition on system level.

b11-0. are a copy of the same bits of parameter DEV_STAT

TEMP.....Last measured temperature. Two's complemented signed byte formatted. Expressed in [degree Celsius]

EVT_TYPE.....Enumeration of event types. See the description table below.

EVT_TYPE	Description	EVT_DATA
0x01	High operating temperature alert	TEMP_DATA
0x02	Low operating temperature alert	
0x03	Operating temperature returned to normal range	
0x81	High application temperature alert	
0x82	Low application temperature alert	
0x83	Application temperature returned to normal range	
0x84	Application temperature sensor issue	
0x85	High application hygrometry alert	HYGRO_DATA
0x86	Low application hygrometry alert	
0x87	Application hygrometry returned to normal range	
0x88	Application hygrometry sensor issue	
0x89	State changed on source 1	SRC_DATA
0x8A	State changed on source 2	
0x8B	References initialized	REF_DATA
0x8C	Counters reset	CTR_RST_DATA
0x8D	Data error on source x	ERR_DATA

EVT_DATA.....Data related to the event. See the description table below.

TEMP_DATA – Size 4 bytes		
Byte 1 – Byte 4		
MSB	…	LSB
Temperature value expressed in 1/256th degree Celsius, Two's complemented		

HYGRO_DATA – Size 4 bytes		
Byte 1 – Byte 4		
MSB	…	LSB
Hygrometry value expressed in 1/256th %		

SRC_DATA – Size 45 bytes														
Byte 1	Byte 2	Byte 3 – Byte 6			Byte 7 – Byte 10			Byte 11 – Byte 14			Byte 15 – Byte 18			
		MSB	…	LSB	MSB	…	LSB	MSB	…	LSB	MSB	…	LSB	
b7-4: Previous state b3-0: New state	Source	Counter state 0			Counter state 1			Counter state 2			Counter state 3			

Byte 19 – Byte 22			Byte 23 – Byte 28			Byte 29	Byte 30 – Byte 44
MSB	…	LSB	MSB	…	LSB		
Counter state 4			Position (see description in Appendix D)			Hygrometry value expressed in %	• User data as defined in parameter USER_DATA

REF_DATA – Size 27 bytes																	
Byte 1	Byte 2 – Byte 3			Byte 4 – Byte 5			Byte 6 – Byte 20			Byte 21 – Byte 26			Byte 21 – Byte 26				
	MSB		LSB	MSB		LSB	MSB	…	LSB	MSB	…	LSB	MSB	…	LSB		
b7-4: Source 1 configuration b3-0: Source 2 configuration	References initialized as defined in (0x34) – Start references initialization			Reception ordo ID as defined in parameter RCP_ORD_ID			User data as defined in parameter USER_DATA			Position source 1 (see description in Appendix D)			Position source 2 (see description in Appendix D)				

CTR_RST_DATA – Size 1 byte	
b7-4	b3-0
Source 1 configuration	Source 2 configuration

ERR_DATA – Size 2 bytes	
Byte 1	Byte 2
b7-4: Source 1 configuration b3-0: Source 2 configuration	Source that triggered the error

OTOTx_info.....Time between the moment the frame is generated and the moment of sending [expressed in seconds]
Occupies always the last 2 bytes in this type of frame
Thus, event calculated timestamp is: `reception time - OTOTx_delay`

3.1.3 Apprendix D

Byte 1 – Byte 2		Byte 3 – Byte 4		Byte 5 – Byte 6
MSB	LSB	MSB	LSB	…
Current weight in g		Previous weight in g		Not relevant, 0xFFFF

3.2 Periodic picture frames

REMINDER ***Allocated frame headers are 0x6C, 0x6D, 0x6E and 0x6F.***
The first 3 will be used for respectively short, standard and long frame type.
The forth one is available for any other special periodic picture frame format.
A device can support only some of these frame types, according to its specifications.

See Periodic picture frame feature and sending mechanisms in section **Erreur ! Source du renvoi introuvable.**.

3.2.1 [0x6C] – Short periodic picture frame

Frame format

FH	STATUS		TEMP	S1_ST	S2_ST	S1_ST0	S2_ST0	S1_CTR	S2_CTR	ACT_PER
0	1 2		3	4	5	6	7	8	9	10
0x6C	MSB	LSB								

STATUS.....Status of the device and basic frame counter:
b15-12 are a basic spontaneous frame counter that overlaps each 16 spontaneous frame generated. This is typically used to detect frame repetition on system level
b11-0. are a copy of the same bits of parameter DEV_STAT

TEMP.....Last measured temperature form Clover-Sense sensor
Two's complemented signed byte formatted

S1_ST.....Previous and current state of source 1:
b7-4... previous state
b3-0... current state

S2_ST.....Previous and current state of source 2:
b7-4... previous state
b3-0... current state

S1_ST0.....Source 1 percentage of time passed in state 0 since last transmission. 0xFF means not allowed by current profile

S2_ST0.....Source 2 percentage of time passed in state 0 since last transmission. 0xFF means not allowed by current profile

S1_CTR.....Source 1 counter of current state limited to 1 byte

S2_CTR.....Source 2 counter of current state limited to 1 byte

ACT_PER.....Activity percentage. Current device usage in % (0% = battery full)

3.2.2 [0x6D] – Standard periodic picture frame

Frame format

FH	STATUS		TEMP	S1_ST	ACT_PER	SRC1	S1_CTR0	S1_CTR1	S1_CTR2
0	1 2		3	4	5	6	7 10	11 14	15.....18
0x6D	MSB	LSB							

S1_CTR3	S1_CTR4	S1_POS	HYGRO	USER_DATA	OTOTx_info	
19 22	23 26	27 32	33	34 48	49 50	
					MSB	LSB

STATUS.....Status of the device and basic frame counter:
b15-12 are a basic spontaneous frame counter that overlaps each 16 spontaneous frame generated. This is typically used to detect frame repetition on system level
b11-0. are a copy of the same bits of parameter DEV_STAT

TEMP.....Last measured temperature form Clover-Sense sensor
Two's complemented signed byte formatted

S1_ST.....Previous and current state of source 1:
b7-4... previous state
b3-0... current state

ACT_PER.....Activity percentage. Current device usage in % (0% = battery full)

SRC1.....Source 1 configuration

S1_CTRx.....Source 1 counters of different states

S1_POS.....Source 1 current position (see description in Appendix D)

HYGRO.....Hygrometry value expressed in %

USER_DATA.....User data as defined in parameter USER_DATA

OTOTx_info.....Time between the moment the frame is generated and the moment of sending [expressed in seconds]
Occupies always the last 2 bytes in this type of frame
Thus, event calculated timestamp is: `reception time - OTOTx_delay`

3.2.3 [0x6F] – Special periodic picture frame

Frame format

FH	S1_ST	S2_ST	S1_ST0	S2_ST0	ACT_PER	SRCS	S1_CTR0	S1_CTR1	S1_CTR2
0	1	2	3	4	5	6	7 10	11 14	15 18
0x6F									

S1_CTR3	S1_CTR4	S2_CTR0	S2_CTR1	S2_CTR2	S2_CTR3	S2_CTR4	HYGRO
19 22	23 26	27 30	31 34	35 38	39 42	43 46	47

S1_ST.....Previous and current state of source 1:
b7-4... previous state
b3-0... current state

S2_ST.....Previous and current state of source 1:
b7-4... previous state
b3-0... current state

S1_ST0.....Source 1 percentage of time passed in state 0 since last transmission. 0xFF means not allowed by current profile

S2_ST0.....Source 2 percentage of time passed in state 0 since last transmission. 0xFF means not allowed by current profile

ACT_PER.....Activity percentage. Current device usage in % (0% = battery full)

SRCS.....Configuration of sources:
b7-4... source 1 configuration
b3-0... source 2 configuration

S1_CTRx .....Source 1 counters of different states

S2_CTRx .....Source 2 counters of different states

HYGRO.....Hygrometry value expressed in %

3.3 Periodic datalogging frames

REMINDER ***Allocated frame headers are 0x70, 0x71, 0x72 and 0x73.***
The first 3 will be used for respectively short, standard and long frame type.
The forth one is available for any other special periodic datalogging frame format.
A device can support only some of these frame types, according to its specifications.

See Periodic datalogging frame feature and sending mechanisms in section **Erreur ! Source du renvoi introuvable.**.

The number of records brought is determined thanks to the frame length by assuming that the 2 last bytes are always OTOTx_delay.

WARNING ***Periodic datalogging frame only bring a continuous set of records. If a discontinuity occurs (device RTC set) et datalogging configuration changes (period, sensor data), the device has to send de current continuous data before starting the new continuous flow.***

3.3.1 [0x71] – Standard periodic datalogging frame

Frame format

FH	STATUS		RTC_REC1			DATA_PERIOD		REC1			…	RECn*			OTOTx delay	
0	1 2		4 7			8 9		10			…	.....			n-1 ..... n	
0x71	MSB	LSB	MSB		LSB	MSB	LSB	MSB		LSB	…	MSB		LSB	MSB	LSB

STATUS.....Status of the device and basic frame counter:

b15-12 are a basic spontaneous frame counter that overlaps each 16 spontaneous frame generated. This is typically used to detect frame repetition on system level.

b11-0. are a copy of the same bits of parameter DEV_STAT

RTC_REC1.....RTC of first record contained in this frame

DATA_PERIOD.....Time period expressed in multiple of [10sec] that separate each record contained in this frame

RECn..... **TO BE DEFINED**

OTOTx_delay.....Time between the moment the frame is generated and the moment of sending [expressed in seconds]
Occupies always the last 2 bytes in this type of frame
Thus, event calculated timestamp is: `reception time - OTOTx_delay`

3.3.2 [0x72] – Long periodic datalogging frame

Long periodic datalogging frame has got the same structure as[0x71] – Standard periodic datalogging frame, but total frame length does not exceed 188 bytes.
Obviously, frame header is 0x72 instead of 0x71.

3.3.3 [0x73] – Special Periodic datalogging frame

Frame format

FH	RTC_REC1			DATA_PERIOD		REC1			…	RECn*		
0	4..... 7			8..... 9		10.....			…	.....		
0x73	MSB		LSB	MSB	LSB	MSB		LSB	…	MSB		LSB

RTC_REC1 .....RTC of first recode contained un this frame

DATA_PERIOD .....Time period expressed in multiple of [10sec] that separate each record contained in this frame

RECn.....**TO BE DEFINED**

Its size is dynamically changed according to **`SFN_EN`**.
Total frame length do not exceed 51 bytes (if no more field is inserted)

3.4 Periodic event list frames

REMINDER ***Allocated frame headers are 0x74, 0x75, 0x76 and 0x77.***
The first 3 will be used for respectively short, standard and long frame type.
The forth one is available for any other special periodic event list frame format.
A device can support only some of these frame types, according to its specifications.

3.4.1 [0x75] – Standard periodic event list frame

Frame format

FH	STATUS		EVENT1			...	EVENTn*		
0	1 2		10			...	.....		
0x75	MSB	LSB	MSB		LSB	...	MSB		LSB

STATUS.....Status of the device and basic frame counter:

b15-12 are a basic spontaneous frame counter that overlaps each 16 spontaneous frame generated. This is typically used to detect frame repetition on system level.

b11-0. are a copy of the same bits of parameter DEV_STAT

EVENTn.....Recorded event field, from older to most recent.
Total frame length do not exceed 51 bytes (if no more field is inserted)

3.4.2 [0x76] – Long periodic event list frame

Long periodic event list frame has got the same structure as [0x75] – Standard periodic event list frame, but total frame length do not exceed 188 bytes.
Obviously, frame header is 0x76 instead of 0x75.

3.5 Keep-alive frames

REMINDER ***Allocated frame headers are 0x78, 0x79, 0x7A and 0x7B.***
The first 3 will be used for respectively short, standard and long frame type.
The forth one is available for any other special keep-alive frame format.
A device can support only some of these frame types, according to its specifications.

See Keep-alive frame feature and sending mechanisms in section Erreur ! Source du renvoi introuvable..

NOTE ***Since any keep-alive frame type brings FW version, triggering on of these frame to the requester allow to get the FW version.***

3.5.1 [0x78] – Short keep-alive frame

Frame format

FH	RTC			BATT	CIF	FW_VER		OTOTx_delay	
0	1 4			5	6	7 8		9 10	
0x78	MSB		LSB			MSB	LSB	MSB	LSB

RTC .....Device RTC when the frame is delivered to the OTOTx service [in seconds since 01/01/2010]

BATT .....Consumed battery level [%]

CIF .....Customer Information Field

FW_VER .....FW version [major.minor]

OTOTx_delay .....Time between the moment the frame is delivered to OTOTx service the moment of sending [expressed in seconds]
Thus, device RTC at the moment of the frame reception (more or less few seconds) is RTC + OTOTx_delay. Occupies always the last 2 bytes in this type of frame

3.5.2 [0x79] – Standard keep-alive frame

Frame format

FH	RTC	BATT	CIF	FW_VER	FW_NB	SC_CFG	SC1_PER	SC1_MODE	SC1_CH
0	1 4	5	6	7 9	10 11	12 13	14..... 15	16	17
0x79	MSB FIRST			MSB FIRST	MSB FIRST	MSB FIRST	MSB FIRST		

SC1_SF	TX_PWR	LWAN TX_PWR	GBL_RST	PWR_RST	FRM_SENT	NRJ_DET	SCW_DET	FRM_RCV
18	19	20	21	22	23.....24	25 26	27 28	29 30
					MSB FIRST	MSB FIRST	MSB FIRST	MSB FIRST

DAY_PAST	CORE_FL	CORE_FLD	UR_TABLE0	UR_TABLE1	EXT_CH	RFU	OTOTx_delay
31 32	33 34	35 36	37 38	39..... 40	41	42 .. 48	49 50
MSB FIRST	MSB FIRST	MSB FIRST	MSB FIRST	MSB FIRST			MSB FIRST

RTC .....Device RTC when the frame is delivered to the OTOTx service [in seconds since 01/01/2010]

BATT.....Consumed battery level [%]

CIF .....Customer Information Field

FW_VER.....FW version [major.minor.test_id]

FW_NB.....FW number

SC_CFG .....Clover-Net scan configuration

SC1_PER.....Clover-Net scan 1 period

SC1_MODE.....Clover-Net scan 1 mode

SC1_CH.....Clover-Net scan 1 channel

SC1_SF .....Clover-Net scan 1 LoRa Spreading Factor

TX_PWR .....Clover-Net current Tx Power in dBm

LWAN_TX_PWR.....LoRaWAN current power in dBm

GBL_RST.....Global number of resets

PWR_RST.....Number of power-on resets

FRM_SENT .....Number of frames sent

NRJ_DET.....Number of power detected in FSK and valid CAD in LoRa, expressed in x8

SCW_DET .....Number of syncword detected in FSK and valid header in LoRa

FRM_RCV.....Number of frames received intended for this device

DAY_PAST.....Number of days past since device was started

CORE_FL.....Internal Clover-Core flags

CORE_FLD .....Internal Clover-Core dynamic flags

UR_TABLE0.....Number of unread logs in table 0

UR_TABLE1 .....Number of unread logs in table 1

EXT_CH.....Number of known childs in Extender service (0x00 if not active)

RFU.....Reserved for Future Use

OTOTx_delay.....Time between the moment the frame is delivered to OTOTx service the moment of sending [expressed in seconds]
Thus, device RTC at the moment of the frame reception (more or less few seconds) is RTC + OTOTx_delay. Occupies always the last 2 bytes in this type of frame

4 Commands description

4.1 Generalities

As described in section **Erreur ! Source du renvoi introuvable.**, generic command frame headers are allocated from **0x01 to 0x33**.
By the way, special request frames are allocated from **0x34 to 0x67** (there will not be described here since they are closely linked to the application, and frame header are not imposed, just the range has to be considered).

4.2 Generic commands

4.2.1 Generic commands list

Frame header	Description
0x00	Trigger spontaneous frame
0x01	Read firmware version
0x03	Read parameters
0x04	Write parameters
0x05	Reset parameters
0x07	Read logs
0x10	Read RTC
0x11	Write RTC
0x12	Write RTC by delta
0x17	Launch installation process
0x18	Device integrity references initialization

4.2.2 Generic commands details

4.2.2.1 (0x00) - Trigger spontaneous frame

This command allows to force sending one of the spontaneous frame. The desired frame is given by `FRAME` parameter which correspond to its frame header (one of those specified in section Spontaneous frames.

`TX_MODE` permits the select the way of sending between the mode described in section Communication modes for spontaneous frames.

NOTE ***This command has no limitation: if we ask for sending a frame which is longer than the size supported by the requested `TX_MODE`, nothing will happen since it is impossible to send it, but the reply will be OK if the device knows the requested `FRAME`.***

Request format

FH	FRAME	TX_MODE	DELAY MIN	DELAY MAX	CUSTOM_DATA
0	1	2	3	4	5.....n
0x00					

FRAME.....Frame header of the spontaneous frame we want to trig a sending

TX_MODE.....Mode used to send the requested frame
If 0xFF → the current configuration is used else, specify another mode (same definition as EVT_MODE, PP_MODE, PDL_MODE, PEL_MODE, KA_MODE, VS_MODE).

DELAY MIN & MAX.....Min and Max values in seconds used to set a random delay for sending the frame
If both 0xFF, uses the configurated values associated ot the frame type (`FRAME`)

CUSTOM_DATA.....Specify application data to send. If left empty, application will fill buffer.

Reply format

FH	STATUS
0	1
0x80	

STATUS.....Request status:
0x00 = Sending will be processed
0xFF = Such a frame is not supported
0xFE = Such a tx mode is not supported
0xFD = Min delay must be lower or equal to max delay
0xFC = Frame triggering failed

4.2.2.2 (0x01) – Read firmware version

Firmware version reading request format

CMD	-
1 byte	-
0x01	

Firmware version reading answer format

ANS	APP_FW_NB	APP_FW_VER	RES_FW_NB	RES_FW_VER	BOOT_VER	REJ_OTA
1 byte	2 bytes	4 bytes	2 bytes	4 bytes	4 bytes	1 byte
0x81	Applicative fw number	Applicative fw version	Rescue fw number	Rescue fw version	Bootloader version	Rejected actions on firmware upgrade*

* Rejected Actions:
This filled was provided during the initialization of the RF service "firmware upgrade" (done automatically at the initialization of the product). It is used to inform the RF service "firmware upgrade" to reject some firmware upgrade session. Most of time when encryption is required on application, none crypt messages are all rejected to prevent attacks.

b5.....A Bootloader firmware upgrade will be rejected
b4.....A Rescue firmware upgrade will be rejected
b3.....A continue of the previous session (session in timeout) will be rejected
b2.....A firmware downgrade will be rejected
b1.....on Firmware reboot the EEPROM erasing will be rejected
b0.....A none crypt firmware upgrade session will be rejected

4.2.2.3 (0x03) – Read parameters

Request format

FH	NB_PARAM	P1_ID	P1-SIZE	...*	Pn_ID *	Pn_SIZE*
0	1	2	3	...	[1B]	[1B]
0x03						

NB_PARAM.....Number of parameters to be read

P1_ID .....ID of parameter 1 to read (same for Pn_ID)

P1_SIZE.....Size of the parameter 1 to read (same for Pn_SIZE)

Reply format

FH	NB_PARAM	P1_ID	P1_SIZE	P1_VALUE	...	Pn_ID*	Pn_SIZE*	Pn_VALUE*
0	1	2	3	[mB]		[1B]	[1B]	[oB]
0x83			m				o	

NB_PARAM.....Number of parameters read

P1_ID .....ID of parameter 1 read (same for Pn_ID)

P1_SIZE.....Size of the parameter 1 read (same for Pn_SIZE)

P1_VALUE .....Value of the parameter 1 read

NOTE ***In case of request format error, reply will be*** `8300FF`.

4.2.2.4 (0x04) – Write parameters

Request format

FH	NB_PARAM	P1_ID	P1-SIZE	P1_VALUE	…*	Pn_ID *	Pn_SIZE*	Pn_VALUE
0	1	2	3	[mB]	…	[1B]	[1B]	[oB]
0x04			m				o	

NB_PARAM.....Number of parameters to be write

P1_ID .....ID of parameter 1 to write (same for Pn_ID)

P1_SIZE.....Size of the parameter 1 to write (same for Pn_SIZE)

P1_VALUE .....Value of the parameter 1 write

Reply format

FH	NB_PARAM	P1_ID	P1_STATUS	…	Pn_ID*	Pn_STATUS*
0	1	2	3		[1B]	[1B]
0x84						

NB_PARAM.....Number of parameters written

P1_ID .....ID of parameter 1 written (same for Pn_ID)

P1_STATUS.....Writing status same for Pn_SIZE):
00 = Writing success
FF = Writing error (see note below)

NOTE ***In case of param information error, its reply will be …<Pn_ID>FF and <Pn_VALUE> will be missing.***

4.2.2.5 (0x04) – Write parameters by bit mask

NOTE ***The frame header is the same as for the standard Write appli parameter command. The difference is that most significant bit in the parameter size is set to one. In such a case, this allows to insert the bit mask between this size and the param value.***

Request format

FH	NB_PARAM	P1_ID	P1-SIZE	P1_MASK	P1_VALUE	…	Pn_ID *	Pn_SIZE*	Pn_PASK*	Pn_VALUE
0	1	2	3	[mB]	[mB]	…	[1B]	[1B]	[oB]	[oB]
0x04			m with b7 set to 1					o with b7 set to 1		

NB_PARAM.....Number of parameters to be write

P1_ID .....ID of parameter 1 to write (same for **`Pn_ID`**)

P1_SIZE.....Size of the parameter 1 to write (same for **`Pn_SIZE`**) | 0x80
0x81 for 1 byte long, 0x82 for 2 bytes long…

P1_MASK.....Bit mask over the parameter. Only the bits masked at 1 will be updated in the paramter according to the correpsonding **`P1_VALUE`** bits

P1_VALUE .....Value of the parameter 1 write

Reply format

FH	NB_PARAM	P1_ID	P1_STATUS	…	Pn_ID*	Pn_STATUS*
0	1	2	3		[1B]	[1B]
0x84						

NB_PARAM.....Number of parameters written

P1_ID .....ID of parameter 1 written (same for **`Pn_ID`**)

P1_STATUS.....Writing status same for **`Pn_SIZE`**):
00 = Writing success
FF = Writing error (see note below)

NOTE ***In case of param information error, its reply will be …<Pn_ID>FF and <Pn_VALUE> will be missing.***

NOTE ***Standard param writing and bit mask writing can be merge in a single Write appli param command, depending on the b7 of each param size field.***

4.2.2.1 (0x05) – Reset parameters

Request format

FH	LIST	TABLE	TYPE
0	1	2	3
0x05			

LIST.....List of parameters to reinitialize
b1 ..... Application parameters
b0..... Generic parameters

TABLE.....Default table ID to use (0x00 = First table). Only used for application parameters.

TYPE .....Type of parameters to reinitialize
0x00... Configuration and exploitation parameters
else ... Configuration parameters only

Reply format

FH	STATUS
0	1
0x85	

STATUS.....Request status:
0x00 = Reinitialization processed
0xFF = Request format error
0xFE = Error on all param reinit
0xFD = Error on generic param reinit
0xFC = Error on application param reinit

4.2.2.2 (0x07) – Read event datalogging

Request format

FH	T_INDEX	MODE	START_ID			NUM	
0	1	2	3.....6			7..... 8	
0x07			MSB		LSB	MSB	LSB

T_INDEX.....Table index, it has to correpsond to an event datalogging table, otherwise the request will be rejected.

MODE.....Defines theway of reading Log records (records are inserted in answer always starting from oldest one):

0x00... Read the requested number of events starting from the most recent one, toward the oldest one. Field START_ID is not taken in account when MODE = 0x00.
If field NUM = 0, all valid records (which can fit in multiframe answer) are returned.

0x01... Read the requested number of events starting from the oldest one, toward the most recent one. Field START_ID is not taken in account when MODE = 0x01.
If field NUM = 0, all valid records (which can fit in multiframe answer) are returned.

0x02... Read the unread log records (pointed by ### parameter). The ecords are always read starting from oldest unread event, toward the most recent one. Field START_ID is not taken in account when MODE = 0x02.
After reading, ### parameter is updated (decreased) with number of read

records.
If field NUM = 0, all valid records (which can fit in multiframe answer) are returned.

0x03... Read the log records starting from the record number pointed by START_ID. Records are always read starting from pointed by START_ID, toward recent one.
If field E_NUM = 0, all records starting from pointed by START_ID, toward recent one (which can fit in multiframe answer) are returned.

START_ID .....Index of the first evnet record in the table to start from (toward the most recent one). It is taken in account only when MODE = 0x03.

NUM .....Number of records to be read.
If NUM = 0, all valid records (which can fit in multiframe answer) are returned.

Reply format

FH	START_ID			STATUS	REC_SIZE	NUM			REC1			...	RECn		
0	1..... 4			5	6	7 10			11 x			...	y ..... z		
0x87	MSB		LSB			MSB		LSB	MSB		LSB		MSB		LSB

START_ID .....Index of first event included in the answer (this is the oldest event)

STATUS.....Bit field defining type of log table:

b2..... If set some events were lost before read (could happen if higher number of events than number of events which can fit in max. multiframe answer were not read), else there are no lost events.

b1 ..... If set every log record contains time stamp (first 4 bytes) on the moment of storing;

b0..... If set this table is Periodic, else it is Normal.

REC_SIZE.....Record size in bytes.

NUM .....Total numbers of records included in answer (in all frames if this is multiframe answer).

RECn.....Event record field (depends on device specifications

Reply format in case of error.

If the request syntax is not correct (table type is periodic, frame request size is wrong, not valid table index, wrong starting log number, etc..), le reply format is the following:

FH	STATUS
0	1
0x87	

STATUS.....Bit field defining type of log table: ####

4.2.2.3 (0x10) – Read RTC

Request format

FH	-
0	
0x10	

Reply format

FH	RTC		
0	1 4		
0x90	MSB		LSB

RTC .....Current device RTC (in number of seconds since 01/01/2010)

4.2.2.4 (0x11) – Write RTC

Request format

FH	VALUE		
0	1 4		
0x11	MSB		LSB

VALUE .....New device RTC (in number of seconds since 01/01/2010)

Reply format

FH	STATUS
0	
0x91	

STATUS.....0x00 : RTC update success
0xFF : RTC update failed

4.2.2.1 (0x12) – Write RTC by delta

Request format

FH	VALUE		
0	1 4		
0x12	MSB		LSB

VALUE .....signed value, number of seconds used to add to RTC

Reply format

FH	STATUS
0	
0x92	

STATUS.....0x00 : RTC update success
0xFF : RTC update failed

4.2.2.2 (0x17) – Launch installation process

NOTE ***This request can be sent only by Clover-Net.***

Receiving this frame has the same effect as we have installation request by reed/button.

Request format

FH	MODE	PER	NB
0	1.....4	5.....6	7
0x17			

MODE.....“INST_MODE” parameter value. If set to 0, current value is used else value is written.

PER.....“INST_PER” parameter value. If set to 0, current value is used else value is written.

NB .....“INST_NB” parameter value. If set to 0, current value is used else value is written.

NOTE ***In current version, only one attempt is executed so PER and NB parameters are not managed.***

Immediate Reply format

FH	TYPE	STATUS
0	1	2
0x97	0x00	

STATUS.....Installation launching status:
0x00: Installation ongoing
0xFF: Error in frame format

Following Reply format

FH	TYPE	STATUS	DEV_STAT
0	1	2	3.....4
0x97	0x01		

STATUS.....Installation status:
0x00: Installation finished, network required connected
0xFF: Installation finished, at least one required network not connected

DEV_STAT.....See definition of parameter DEV_STAT

4.2.2.3 (0x18) – Device integrity references initialization

This request is used to force a references (re)initialization in device integrity feature. This will affect TILT and/or MAGNETIC references depending on features enabled and chip embedded.

Request format

FH	-
0	
0x18	

Reply format

FH	STATUS
0	1
0x98	

STATUS.....Reference initialization launching status:
0x00: Reference intialization ongoing
0xFF: Error in configuration of device

4.3 Applicative commands

4.3.1 Applicative commands list

Frame header	Description
0x34	Start references initialization
0x37	Immediate reading
0x38	Source initialization

4.3.2 Applicative commands details

4.3.2.1 (0x34) – Start references initialization

This command allows to initialize references used by the device for TILT, MAGNETIC or TOF sources. This is a part of "applicative installation" process and it takes approximatively 10 seconds. During execution of this initialization, LED will blink in **orange** and it is mandatory to keep the device in required position.

Request format

FH	REF_INIT	
0	1 2	
0x34	MSB	LSB

REF_INIT.....References to initialize
0x0000 means that all references required will be initialized. This depends on active device configuration. Else:

b15-12 unused
b11 .... Initialize TOF reference 4
b10.... Initialize TOF reference 3
b9..... Initialize TOF reference 2
b8..... Initialize TOF reference 1
b7..... Initialize MAGNETIC reference 4
b6..... Initialize MAGNETIC reference 3
b5..... Initialize MAGNETIC reference 2
b4..... Initialize MAGNETIC reference 1
b3..... Initialize TILT reference 4
b2..... Initialize TILT reference 3
b1..... Initialize TILT reference 2
b0..... Initialize TILT reference 1

Reply format

FH	STATUS
0	1
0xB4	

STATUS.....Request status:
0x00 = Start reference initialization success
0xFF = Error

4.3.2.2 (0x37) – Immediate reading

This command is used to execute an immediate reading of a source sensor. The difference with reading of parameter related to this sensor is that a real reading is executed so value is refreshed.

Request format

FH	SENSOR_TO_READ
0	1
0x37	

SENSOR_TO_READ .....This field allows to choose sensor to read.

0x01... REED
0x02... EXTERNAL REED
0x04... TILT
0x05... MAGNETIC
0x07... TOF
0x09... WEIGHT

Reply format

FH	SENSOR_READ	STATUS	VALUE
0	1	2	3.....8
0xB7			

SENSOR_READ .....Sensor effectively read in answer

STATUS.....Status of reading

0x00... Reading success
0xFC .. Reading error – sensor internal error
0xFD .. Reading error – cannot access sensor, retry required
0xFE... Reading error – sensor required to be active to be read
0xFF ... Reading error – sensor not handled

VALUE .....Value of sensor read. This field is always 6 bytes but meaning depends on sensor read. Meaning is described below:

Sensor	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6
REED	0: closed 1: opened	0xFF	0xFF	0xFF	0xFF	0xFF
EXTERNAL REED	0: closed 1: opened	0xFF	0xFF	0xFF	0xFF	0xFF
TILT	X position in degree		Y position in degree		Z position in degree	
MAGNETIC	X magnetic data x1.5mG		Y magnetic data x1.5mG		Z magnetic data x1.5mG	
TOF	Target distance in mm		Signal rate in kcps		Ambiant rate in kcps	
WEIGHT	Current weight in g		0xFF	0xFF	0xFF	0xFF

4.3.2.3 (0x38) – Source initialization

This command is used to execute an initialization of the sensor when it is required.
Source initialization can be, most of the time, executed in standby or in run mode.

Request format

FH	SENSOR_TO_INIT	OPTION
0	1	2.....9
0x38		

SENSOR_TO_INIT.....This field allows to choose sensor to initialize.
0x09... WEIGHT

OPTION .....This field provides optionnal data depending on sensor to initialize.

Sensor	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
WEIGHT	0x00: TARE	0x00	0x00	0x00	0x00	0x00	0x00	0x00
	0x01: FACTOR	Weight, expressed in [g], of the object used to calibrate the scale factor				0x00	0x00	0x00

Reply format

FH	SENSOR_INIT	STATUS
0	1	2
0xB8		

SENSOR_INIT.....Sensor effectively initialized

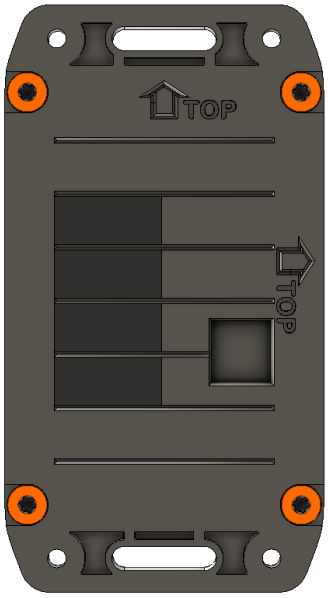
STATUS.....Status of initialization
0x00... Initialization success
0xFC .. Sensor internal error
0xFD .. Cannot access sensor, retry required
0xFE... Sensor required to be active to be read
0xFF ... Sensor not handled

5 Battery replacement and initialization

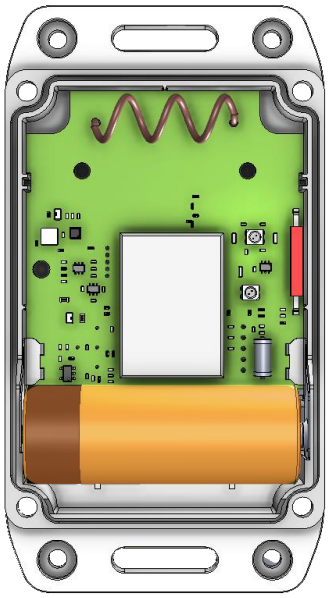
5.1 Battery replacement

Battery reference: FANSO ER18505M

Unscrew the cover fixing screws using Torx T15 screwdriver



Replace the battery with a new one



5.2 Battery level initialization

LoRaWAN downlinks commands on port #1

Battery level initialization is done through a LoRaWAN downlink after replacing the battery

Request	15011104000000000
LoRaWAN answer uplink	94011100

6 Parameters description

Since many parameters are linked to generic features like spontaneous sending, parameters are splitted into 2 different ranges.

- 0x01 to 0x7F are allocated to generic parameters
- 0x81 to 0xFF are allocated to applicative parameters

Parameter types according way of storing are:

xxx-P.....Persistent parameters - current value is stored in EEPROM and loaded on reset

xxx-V.....Volatile – on reset default parameter is loaded

xxx-S.....Signature – Signature signed parameters

Parameter types according way of access are:

RO-x.....Read only parameters – can be read, can't be modified

RW-x.....Read/Write parameters – can be read, can be written

TRWx-x.....Time Slot Read/W parameters – Writing application parameter is done according RW/RWW type. High and Low Time Slot parameters copies are accessed using service 0x01 commands 0x21/0x22 (Read/Write) for Low activities time slots and 0x23/0x24 (Read/Write) for High activities time slots

6.1 Application parameters list [APPLI]

6.1.1 General parameters

ID	NAME	Size	Description
0x80	**APL_PAR_SGNT** [RO-V]	4	**Application parameters Signature** Parameter signature computed over all parameters stamped xxx-S. ***Default value:*** *0x00000000 (initialized at startup)*
0x81	**SFN_EN** [RW-PS] *PROTECTED*	2	**Special Function enabler** b15...GRB led used else RGB led (only relevant for LED-REPORTER) b14-8 reserved b7.....Automatic filtering activated on Source 2. Configured through AUTO_FILT_SRC2. Notified through b5 in APP_STAT b6.....Automatic deactivation activated on Source 1. Configured through AUTO_FILT_SRC1. Notified through b4 in APP_STAT b5.....Oscillation detection system on Source 2. Configured through OSC_DETECT_SRC2. Notified through b11 in PARAM_DEV_STAT b4.....Oscillation detection system on Source 1. Configured through OSC_DETECT_SRC1. Notified through b10 in PARAM_DEV_STAT b3.....reserved b2.....Source 2 linked to source 1. Configured through SRC2_LINK_CONF b1.....reserved b0.....References' initialization is executed on a success installation process ***Default value:*** *0x0001*

0x82	**FN_EN** [RW-PS]	2	**Function enabler** b15-14 reserved b13...Send event when hygrometry exceeds app thresholds b12...Send event when hygrometry goes back below app thresholds b11...Send event when temperature exceeds app thresholds b10...Send event when temperature goes back below app thresholds b9.....Send event when source 2 switches to state 4 b8.....Send event when source 2 switches to state 3 b7.....Send event when source 2 switches to state 2 b6.....Send event when source 2 switches to state 1 b5.....Send event when source 2 switches to state 0 b4.....Send event when source 1 switches to state 4 b3.....Send event when source 1 switches to state 3 b2.....Send event when source 1 switches to state 2 b1.....Send event when source 1 switches to state 1 b0.....Send event when source 1 switches to state 0 ***Default value:*** *0x0023*
0x83	**LED_EN** [RW-PS]	1	**LED enabler** b7-5..reserved b4.....Activate LED in test mode. If source 1 state = 0, red light on, else red light off. If source 2 state = 0, green light on, else green light off. b3.....2 short green blinks when source 2 switches to state n b2.....2 short red blinks when source 2 switches to state 0 b1.....Short green blink when source 1 switches to state n b0.....Short red blink when source 1 switches to state 0 ***Default value:*** *0x10*
0x84	**BCONF_STAT** [RO-P]	1	**Bad configuration / Bad status** b7-2..reserved b1.....SRC2 sensor issue (see PARAM_SRC_ERROR for details) b0.....SRC1 sensor issue (see PARAM_SRC_ERROR for details) ***Default value:*** *0x00*
0x85	**LOG_EN** [RW-PS]	2	**Event Logging enabler** TBD ***Default value:*** *0x0000*
0xCD	**LED_REP_DCOL** [RW-PS]	3	**Led reporter default color** RGB code of color used by default when an advanced LED is embedded ***Default value:*** *0x00FF00 (Green)*
0xD4	**USER_DATA** [RW-P]	15	**User data field** This parameter is used to add optional data to some events and periodic frames. It can be used freely. ***Default value:*** *0x00000000000000000000000000000000*
0xD5	**DEL_TEST_MODE** [RW-PS]	2	**Delay in test mode** After switching to operating mode, device will stay in test mode during this delay expressed in [s] ***Default value:*** *0x0078 (120 s)*

0xD6	**APP_STAT** [RO-P]	2	**Application Status** b15-6 reserved b5.....Source 2 currently filtered b4.....Source 1 currently filtered b3.....unused b2.....TOF references initialized b1.....Magnetic references initialized b0.....Tilt references initialized ***Default value:*** *0x0000*

6.1.2 Temperature and hygrometry sensors parameters

ID	NAME	Size	Description
0x86	**SENSORS_SAMPLING** [RW-PS]	1	**Sensors sampling period** Expressed in multiple of 20 seconds ***Default value:*** *0x03 (60 seconds)*
0x87	**SENSOR_TYPE** [RO-V]	1	**Sensor type detected and state** b7.... Error occurred on reading external sensor b6.... Externa sensor conversion was not finished on reading b5.... External sensor acquisition ongoing b4.... reserved b3-0... Sensor detected type: 0x0... CloverSense temperature sensor (no external sensor detected) 0x1... DS18B20 external temperature sensor detected 0x2... SHTC3 external hygrometry + temperature sensor detected 0x3... SHT3 external hygrometry + temperature sensor detected ***Default value:*** *0x00 (not initialized)*
0x88	**TEMP_VAL** [RO-V]	2	**Temperature value** Last acquired temperature value. Expressed in [1/256th degree Celsius] ***Default value:*** *0x1900 (25°C)*
0x89	**TEMP_THS_H** [RW-PS]	2	**Temperature exceeds high threshold** Temperature threshold used for application temperature high limit detection. Expressed in [1/256th degree Celsius] ***Default value:*** *0x3200 (+50°C)*
0x8A	**TEMP_THS_L** [RW-PS]	2	**Temperature exceeds low threshold** Temperature threshold used for application temperature high limit detection. Expressed in [1/256th degree Celsius] ***Default value:*** *0xF600 (-10°C)*
0x8B	**TEMP_HYST** [RW-PS]	2	**Temperature hysteresis** Hysteresis used on thresholds to come back to normal temperature state. Expressed in [1/256th degree Celsius] ***Default value:*** *0x0200 (2°C)*
0x8C	**HYGRO_VAL** [RO-V]	2	**Hygrometry value** Last acquired hygrometry value. Expressed in [1/256th %] 0x7FFF means 5 consecutives error on sensor sampling 0xFFFF means not available (no hygrometry sensor detected) ***Default value:*** *0xFFFF (not detected)*

0x8D	**HYGRO_THS_H** [RW-PS]	2	**Hygrometry exceed - high Threshold** Hygrometry threshold used for application temperature high limit detection. Expressed in [1/256th %] ***Default value:*** *0x5A00 (90%)*
0x8E	**HYGRO_THS_L** [RW-PS]	2	**Hygrometry exceed - low Threshold** Hygrometry threshold used for application temperature high limit detection. Expressed in [1/256th %] ***Default value:*** *0x0A00 (10%)*
0x8F	**HYGRO_HYST** [RW-PS]	2	**Hygrometry hysteresis** Hysteresis used on thresholds to come back to normal Hygrometry state. Expressed in [1/256th %] ***Default value:*** *0x0200 (2%)*

6.1.3 Switch sources parameters

ID	NAME	Size	Description
0x90	**SRC1** [RW-PS] *PROTECTED*	1	**Source 1 configuration** *This is a PROTECTED parameter: can be written only if bit b7 of GFN_EN is set to one* 0x00 ... Disabled 0x03 ... Mems in MOTION detection 0x09 ... Weighing ***Default value:*** *0x09*
0x91	**SRC2** [RW-PS] *PROTECTED*	1	**Source 2 configuration** *This is a PROTECTED parameter: can be written only if bit b7 of GFN_EN is set to one* 0x00 ... Disabled 0x03 ... Mems in MOTION detection 0x09 ... Weighing ***Default value:*** *0x00*
0x92	**STAT_SRC1** [RO-V]	1	**Source 1 current state** Current state of source 1 from 0x00 to 0x04. 0x00 means that device is not in any known position. Else value gives the current position ***Default value:*** *0x00*
0x93	**STAT_SRC2** [RO-V]	1	**Source 2 current state** Current state of source 1 from 0x00 to 0x04. 0x00 means that device is not in any known position. Else value gives the current position ***Default value:*** *0x00*
0x94	**PREV_STAT_SRC1** [RO-V]	1	**Source 1 previous state** Previous state of source 1 from 0x00 to 0x04. 0x00 means that device was not in any known position. Else value gives the previous position ***Default value:*** *0x00*
0x95	**PREV_STAT_SRC2** [RO-V]	1	**Source 2 previous state** Previous state of source 2 from 0x00 to 0x04. 0x00 means that device was not in any known position. Else value gives the previous position ***Default value:*** *0x00*
0x96	**CNT_STAT0_SRC1** [RO-V]	4	**Source 1 state 0 counter** Counter of state 0 detections for source 1 ***Default value:*** *0x00000000*
0x97	**CNT_STAT1_SRC1** [RO-V]	4	**Source 1 state 1 counter** Counter of state 1 detections for source 1 ***Default value:*** *0x00000000*
0x98	**CNT_STAT2_SRC1** [RO-V]	4	**Source 1 state 2 counter** Counter of state 2 detections for source 1 ***Default value:*** *0x00000000*
0x99	**CNT_STAT3_SRC1** [RO-V]	4	**Source 1 state 3 counter** Counter of state 3 detections for source 1 ***Default value:*** *0x00000000*

0x9A	**CNT_STAT4_SRC1** [RO-V]	4	**Source 1 state 4 counter** Counter of state 4 detections for source 1 ***Default value:*** *0x00000000*
0x9B	**CNT_STAT0_SRC2** [RO-V]	4	**Source 2 state 0 counter** Counter of state 0 detections for source 2 ***Default value:*** *0x00000000*
0x9C	**CNT_STAT1_SRC2** [RO-V]	4	**Source 2 state 1 counter** Counter of state 1 detections for source 2 ***Default value:*** *0x00000000*
0x9D	**CNT_STAT2_SRC2** [RO-V]	4	**Source 2 state 2 counter** Counter of state 2 detections for source 2 ***Default value:*** *0x00000000*
0x9E	**CNT_STAT3_SRC2** [RO-V]	4	**Source 2 state 3 counter** Counter of state 3 detections for source 2 ***Default value:*** *0x00000000*
0x9F	**CNT_STAT4_SRC2** [RO-V]	4	**Source 2 state 4 counter** Counter of state 4 detections for source 2 ***Default value:*** *0x00000000*
0xD7	**SRC2_LINK_CONF** [RW-PS]	5	**Source 2 linked to source 1 configuration** **[1 byte] Source 2 activation** b7-2. unused b1..... Source 2 activated when source 1 state n detected b0..... Source 2 activated when source 1 state 0 detected **[1 byte] Source 2 deactivation** b7-2. unused b1..... Source 2 deactivated when delay expired b0..... Source 2 deactivated when activation condition not fulfilled anymore (only possible if only 1 state of source 1 is used) **[2 bytes] Deactivation delay** Delay expressed in [s] before deactivating source 2 **[1 byte] Source 2 state when deactivated** State to force when source 1 deactivates source 2. 0xFF means do not force any state ***Default value:*** *0x0101003C01*

0xDB	**OSC_DETECT_SRC1** [RW-PS]	4	**Source 1 oscillation detection configuration** **[1 byte] Window duration** Window duration to check oscillations expressed in [m]. Minimum is 1 maximum is 60. **[1 byte] Oscillation detection threshold** Minimum number of transitions between states counted on window before detecting oscillation. Count must be strictly higher. **[1 byte] Oscillation stops detection threshold** Maximum number of transitions between states counted on window before going back to normal. Count must be lower or equal. **[1 byte] State to force** State to force on source when oscillation detected *Oscillation detection feature on source 1 must by activated through bit b4 in PARAM_SFN_EN and when it is detected, bit b10 is set in PARAM_DEV_STAT.* ***Default value:*** *0x0A070200*
0xDC	**OSC_DETECT_SRC2** [RW-PS]	4	**Source 2 oscillation detection configuration** **[1 byte] Window duration** Window duration to check oscillations expressed in [m] **[1 byte] Oscillation detection threshold** Minimum number of transitions between states counted on window before detecting oscillation **[1 byte] Oscillation stops detection threshold** Maximum number of transitions between states counted on window before going back to normal **[1 byte] State to force on source when oscillation detected** State to force on source when oscillation detected *Oscillation detection feature on source 1 must by activated through bit b5 in PARAM_SFN_EN and when it is detected, bit b11 is set in PARAM_DEV_STAT.* ***Default value:*** *0x0A070200*
0xE5	**SRC_ERROR** [RO-P]	2	**Sources error detected** **[1 byte] Error on source 1** **[1 byte] Error on source 2** Error detected on sources. 0x00 means no error detected else, definition depends on source type (see Appendix E: Description of errors depending on source) *When an error is detected on a source, error information is stored here and source is disabled.* ***Default value:*** *0x0000*

0xE8	**AUTO_FILT_SRC1** [RW-PS]	4	**Source 1 automatic filtering** **[2 bytes] Filtering trigger and features impacted** b15-8 unused b7.... Full source filtered (alarm sending and counting), else if not set, only alarm sending is filtered b6-2. unused b1..... Source filtered after other state detected b0..... Source filtered after state 0 detected **[2 bytes] Filtering duration** Filtering duration expressed in [s] ***Default value:*** *0x0082003C*
0xE9	**AUTO_FILT_SRC2** [RW-PS]	4	**Source 2 automatic filtering** **[2 bytes] Filtering trigger and features impacted** b15-8 unused b7.... Full source filtered (alarm sending and counting), else if not set, only alarm sending is filtered b6-2. unused b1..... Source filtered after other state detected b0..... Source filtered after state 0 detected **[2 bytes] Filtering duration** Filtering duration expressed in [s] ***Default value:*** *0x0082003C*

6.1.4 Event sending parameters

ID	NAME	Size	Description
0xA0	**ALR_DEL_STAT0** [RW-PS]	2	**Event delay for state 0** Delay to wait in state 0 before generating an event (for both sources) ***Default value:*** *0x0000*
0xA1	**ALR_DEL_STATn** [RW-PS]	2	**Event delay for state 1-4** Delay to wait in state 1 to 4 before generating an event (for both sources) ***Default value:*** *0x0000*

6.1.5 WEIGHING source parameters

ID	NAME	Size	Description
0xDD	**WEIGHING_TARE** [RO-P]	6	**Weighing tare** **[4 bytes] Tare value** Expressed as a RAW load sensor value. **[2 byte] Tare temperature** Signed and expressed in [1/256th degree Celsius]. At calibration stage, it is necessary to execute (0x38) – Source initialization command with first option byte = 0x01 to execute TARE in order to eliminate weight of a weighing pan for example. This action must be done before FACTOR initialization. ***Default value:*** *0x000000000000*
0xDE	**WEIGHING_FACTOR** [RO-P]	4	**Weighing factor** Factor used to convert raw value in [g]. At calibration stage, it is necessary to execute (0x38) – Source initialization command with first option byte = 0x02 to execute FACTOR initialization. This action must be done after TARE initialization. ***Default value:*** *0x3F800000*

0xDF	**WEIGHING_CONF** [RW-PS]	10	**Weighing source and trig configuration** **[1 byte] Trig configuration** b7-6… unused b5…… Threshold is subtracted to reference. If value is higher than reference - threshold, source is in the given state. b4…… Threshold is added to reference. If value is lower than reference + threshold, the source is in the given state. b3…… Allow negative value (for force management) b2…… Immediate threshold mode: in this mode, only W_REF_THS_1 'Threshold 1' value is used. Every time a change on weight higher than +/- this threshold is detected; State 0 is set and the new weight is stored as reference for next event. This mode allows to send EVENT frames every time a change of, at least, threshold value is detected. When this bit is reset, normal mode is used and, in this mode, up to 4 different references and thresholds can be used. b1-0… In normal mode: Defines number of positions managed: 0x0…. State 0 means not in any saved position and State 1 means in saved position 1 0x1… Same as previous + State 2 means in saved position 2 0x2… Same as previous + State 3 means in saved position 3 0x3… Same as previous + State 4 means in saved position 4 **[2 bytes] Sampling period** Expressed in [x100ms] **[2 bytes] Hysteresis** Hysteresis is subtracted from thresholds to come back inside a position. To be used it requires to have thresholds higher than hysteresis. Expressed in [g] **[1 byte] Samples** Sample number to validate a state change **[2 bytes] Samples delay** Delay between samples. Expressed in [x100ms] **[2 bytes] Temperature compensation coefficient** If 0x0000, no temperature compensation applied. Else, temperature compensation is activated and this value is the coefficient used [x1/10000]. ***Default value:*** *0x040014000A02000A0000*
0xE0	**WEIGHT** [RO-V]	2	**Current weight** Weight measured. Expressed in [g] ***Default value:*** *0x0000*
0xE1	**W_REF_THS_1** [RW-PS]	4	**WEIGHING source reference and threshold 1** **[2 bytes] Reference 1** Reference saved as state 1 weight expressed in [g] **[2 bytes] Threshold 1** Absolute threshold to detect event for state 1. Expressed in [g] ***Default value:*** *0x00000014*
0xE2	**W_REF_THS_2** [RW-PS]	4	**WEIGHING source reference and threshold 2** **[2 bytes] Reference 2** Reference saved as state 2 weight expressed in [g] **[2 bytes] Threshold 2** Absolute threshold to detect event for state 2. Expressed in [g] ***Default value:*** *0x00000000*

0xE3	**W_REF_THS_3** [RW-PS]	4	**WEIGHING source reference and threshold 3** **[2 bytes] Reference 3** Reference saved as state 3 weight expressed in [g] **[2 bytes] Threshold 3** Absolute threshold to detect event for state 3. Expressed in [g] ***Default value:*** *0x00000000*
0xE4	**W_REF_THS_4** [RW-PS]	4	**WEIGHING source reference and threshold 4** **[2 bytes] Reference 4** Reference saved as state 4 weight expressed in [g] **[2 bytes] Threshold 4** Absolute threshold to detect event for state 4. Expressed in [g] ***Default value:*** *0x00000000*

6.2 Generic parameters list [APPLI ASSISTANT]

6.2.1 General parameters

Param ID	Name	Size	Description
0x00	GEN_PAR_SGNT [RO-V]	4	**Generic parameters signature** Parameter signature computed over all generic parameters stamped xxx-S. ***Default value:*** *0x00000000 (initialized at startup)*
0x01	CIF [RW-PS]	1	**Customer Information Field** Arbitrary register that will be brought by Keep-Alive frame. ***Default value:*** *0x00 (00)*
0x02	GFN_EN [RW-PS]	2	**Generic function enabler** Permits to enable generic function on the device. b15…Protected parameters writing authorized b14…915MHz RF range settings in Standby mode b13-6 reserved b5 ….Actions by reed enabled in operating mode b4 ….Actions by reed enabled in standby mode b3 ….Reserved b2 ….Time Slot service enable b1 ….RTC synchronization enable b0 ….Standby active ***Default value:*** *0x0033 (Both reed actions, RTC synchronization and stand by enabled)*
0x03	DEV_STAT [RO-P]	2	**General Device Status** b15 .Device connected on Clover-Net b14 .Device connected on LoRaWAN b13 .Device connected on Sigfox b12…Application reserved b11…Oscillation detected on source 2 b10…Oscillation detected on source 1 b9 ….Application takes control over Clover-Net settings b8 ….Find device process running b7 ….Device installation in progress b6 ….Current state of Time Slot Service (0-Not Active, 1-Active) b5 ….Bad configuration / Bad status (see BCONF_STAT) b4 ….Device currently is in Test Mode b3 ….Temperature exceed operating limits b2 ….Battery usage exceeds low battery threshold (see LOW_BAT_TH) b1 ….Unread datalogging exceed Log table size (data lost) b0 ….RTC valid ***Default value:*** *0x0000 (all is OK)*
0x04	FR_COUNT [RO-P]	1	**Spontaneous frame counter** Incremented by the generic service 0x03 at each spontaneous frame generation, its 4 less significant bits are inserted in b15-12 of STATUS register (2nd byte) in all spontaneous frame. This is typically used for detecting frame repetition. The value returns to 0x00 after reaching 0xFF. ***Default value:*** *0x00 (0 frames sent)*

0x05	**CLR_MGT** [RO-V]	1	**Clear management** Clearing data like datalogging tables, applicative activity counters is there is. b7-3 reserved b2 ....Battery level initialization to full (self-cleared bit) b1 ....Clear Data Log table 1 (self-cleared bit) b0 ....Clear Data Log table 0 (self-cleared bit) ***Default value:*** *0x0000 (nothing requested)*
0x06	**LED_PER** [RW-PS]	3	**LED period and duration** (continuous alive blink) **[1 byte]** defines the continuous LED blink period (in seconds, 0x00 disables it). **[1 byte]** defines the continuous LED blink duration (in multiple of 50ms). **[1 byte]** defines the HW and number of blink: b7-4 Hardware used to indicate the low battery status (Appendix C) b3-0 Number of blinks (LED off duration is the same as LED on) ***Default value:*** *0x000111 (Continuous blink disabled)*
0x07	**INST_MODE** [RW-PS]	4	**Installation modes** b31...Blind (no com with distant equipment, join procedures still executed) b30-13 reserved b12...Sigfox b11-9 reserved b8 ....LoRaWAN b7-6 reserved b5 ....Clover-Net BCT bit field by order (ordo ID 1 is used) b4 ....Clover-Net BCT b3 ....Clover-Net MCT b2 ....Clover-Net P2P with BCT search (distant equipment research) b1 ....Clover-Net P2P with MCT search (distant equipment research) b0 ....Clover-Net P2P **Default value:** 0x80000100 (Blind mode, LoRaWAN)
0x08	**INST_PER** [RW-PS]	2	**Installation attempt period** Expressed in minutes ***Default value:*** *0x0005 (5 minutes period)*
0x09	**INST_NB** [RW-PS]	1	**Number of installation attempt** When requested by Launch installation process command ***Default value:*** *0x01 (1 installation attempt)*
0x0A	**CN_CONFIG** [RW-PS]	2	**Clover-Net configuration word** Corresponds to the Core param 0x10. In particular applications, this can be only default configuration and can be overridden by other params. ***Default value:*** *0x10CD*
0x68	**CN_PIN_CD** [RW-PS]	4	**Clover-Net PIN CODE** Pin code used to generate an AES128 Key pushed in core param 0x38. ***Default value:*** *0x31323334*

6.2.2 Event frame parameters

Param ID	Name	Size	Description
0x22	**EVT_TYPE** [RW-PS]	1	**Event frame type** Corresponds to the frame type described in section **Erreur ! Source du renvoi introuvable.**. 0x00....Disabled 0x01....Short event frame 0x02....Standard event frame 0x03....Long event frame 0x04....Special event frame ***Default value:*** *0x02 (Standard frame)*
0x23	**EVT_MODE** [RW-PS]	1	**Event frame sending mode** 0x00....Clover-Net P2P 0x01....Clover-Net MCT – no ACK 0x02....Clover-Net MCT –ACK 0x03....Clover-Net BCT – no ACK 0x04....Clover-Net BCT – ACK 0x05....Clover-Net Extender service – no ACK 0x06....Clover-Net Extender service – ACK 0x07....LoRaWAN unconfirmed 0x08....LoRaWAN confirmed 0x09....Sigfox – no ACK 0x0A...Sigfox - ACK ***Default value:*** *0x07 (LoRaWAN unconfirmed)*
0x24	**EVT_DEL1_RNG** [RW-PS]	2	**Event frame first sending random delay rang** Applied on the 1st frame sending only. Random delay computed in range from min to max: [1st byte] minimum, expressed in [seconds], value <= max [2nd byte] maximum, expressed in [seconds], min <= value NOTE: for repetition delay, see params CNET_DELn_RNG and OTHER_DELn_RNG ***Default value:*** *0x0000 (immediate sending)*
0x25	**EVT_REP** [RW-PS]	1	**Event frame repetition number** Applied whatever the sending mode is. Repetitions stop if ACK/confirmation is received. Corresponds to the number of sendings, not only repetitions). Max value: 10 ***Default value:*** *0x03 (3 sending)*
0x26	**EVT_EXT_TOUT** [RW-PS]	1	**Event frame extender timeout** ***Default value:*** *0x01 (1 minute)*

0x27	**EVT_PRTY** [RW-PS]	5	**Event frame priority configuration** NOTE: This is an advanced parameter to be managed by INEO-SENSE team. [1 byte] priority of group 1 [1 byte] priority of group 2 [1 byte] priority of group 3 [1 byte] priority of group 4 [1 byte] priority of group 5 Priority levels are: 0x00....High priority. If transmit list is full, remove the oldest low priority. If no low priority in list then frame is not buffered. 0x01....Low priority. If transmit list is full, remove the oldest low priority. If no low priority in list then frame is not buffered. 0x02....High priority. If transmit list is full, remove the oldest low priority. If no low priority in list then remove the oldest high priority. 0x03....Low priority. If transmit list is full, remove the oldest low priority. If no low priority in list then remove the oldest high priority. 0x04....High priority. If transmit list is full, frame is not buffered. 0x05....Low priority. If transmit list is full, frame is not buffered. ***Default value:*** *0x0000000000*

6.2.3 Periodic picture frame parameters

Param ID	Name	Size	Description
0x28	**PP_TYPE** [RW-PS]	1	**Periodic picture frame default type** Corresponds to the frame type described in section **Erreur ! Source du renvoi introuvable.**. 0x00....Disabled 0x01....Short periodic picture frame 0x02....Standard periodic picture frame 0x03....Long periodic picture frame 0x04....Special periodic picture frame ***Default value:*** *0x02 (Standard frame)*
0x29	**PP_MODE** [RW-PS]	1	**Periodic picture frame sending mode** 0x00....Clover-Net P2P 0x01....Clover-Net MCT – no ACK 0x02....Clover-Net MCT –ACK 0x03....Clover-Net BCT – no ACK 0x04....Clover-Net BCT – ACK 0x05....Clover-Net Extender service – no ACK 0x06....Clover-Net Extender service – ACK 0x07....LoRaWAN unconfirmed 0x08....LoRaWAN confirmed 0x09....Sigfox – no ACK 0x0A...Sigfox - ACK ***Default value:*** *0x07 (LoRaWAN unconfirmed)*
0x2A	**PP_DEL1_RNG** [RW-PS]	2	**Periodic picture frame first sending random delay rang** Applied on the 1st frame sending only. Random delay computed in range from min to max: **[1st byte]** minimum, expressed in [seconds], value <= max **[2nd byte]** maximum, expressed in [seconds], min <= value NOTE: for repetition delay, see params CNET_DELn_RNG and OTHER_DELn_RNG NOTE: for starting delay, see params PER_FR_START_DEL ***Default value:*** *0x0000 (immediate sending)*
0x2B	**PP_REP** [RW-PS]	1	**Periodic picture frame repetition number** Applied whatever the sending mode is. Repetitions stop if ACK/confirmation is received. Corresponds to the number of sendings, not only repetitions). Max value: 10 ***Default value:*** *0x01 (1 frame sent)*
0x2C	**PP_EXT_TOUT** [RW-PS]	1	**Periodic picture frame extender timeout** ***Default value:*** *0x01 (1 minute)*
0x2D	**PP_PER** [RW-PS]	2	**Periodic picture sending period** Expressed in multiple of 30 seconds. Minimum 30 seconds, maximum 72 hours. ***Default value:*** *0x01E0 (4 hours)*

0x2E	**PP_PRTY** [RW-PS]	1	**Periodic picture frame priority configuration** NOTE: This is an advanced parameter to be managed by INEO-SENSE team. Priority level of periodic picture frames in OTOTx service: 0x00....High priority. If transmit list is full, remove the oldest low priority. If no low priority in list then frame is not buffered. 0x01....Low priority. If transmit list is full, remove the oldest low priority. If no low priority in list then frame is not buffered. 0x02....High priority. If transmit list is full, remove the oldest low priority. If no low priority in list then remove the oldest high priority. 0x03....Low priority. If transmit list is full, remove the oldest low priority. If no low priority in list then remove the oldest high priority. 0x04....High priority. If transmit list is full, frame is not buffered. 0x05....Low priority. If transmit list is full, frame is not buffered. ***Default value:*** *0x01*

6.2.4 Periodic datalogging frame parameters

Param ID	Name	Size	Description
0x2F	**PDL_TYPE** [RW-PS]	1	**Periodic datalogging frame default type** Corresponds to the frame type described in section **Erreur ! Source du renvoi introuvable.**. 0x00 … Disabled 0x01 … Short periodic datalogging frame 0x02 … Standard periodic datalogging frame 0x03 … Long periodic datalogging frame 0x04 … Special periodic datalogging frame ***Default value:*** *0x00 (Disabled)*
0x30	**PDL_MODE** [RW-PS]	1	**Periodic datalogging frame sending mode** 0x00 … Clover-Net P2P 0x01 … Clover-Net MCT – no ACK 0x02 … Clover-Net MCT –ACK 0x03 … Clover-Net BCT – no ACK 0x04 … Clover-Net BCT – ACK 0x05 … Clover-Net Extender service – no ACK 0x06 … Clover-Net Extender service – ACK 0x07 … LoRaWAN unconfirmed 0x08 … LoRaWAN confirmed 0x09 … Sigfox – no ACK 0x0A .. Sigfox - ACK ***Default value:*** *0x07 (LoRaWAN unconfirmed)*
0x31	**PDL_READ** [RW-PS]	1	**Periodic datalogging reading mode** b7…… If set, logs marked as read only if frame reception confirmed (in case sending mode can be confirmed) b6-4 … Unused b3-0 … Log reading system: 0x0 … Unread logs are sent from oldest on each periodic sending with more than one frame if necessary. 0x1 … Unread logs are sent from oldest on each periodic sending fitting only one frame. 0x2 … Only most recent unread logs are sent (from oldest) on each periodic sending fitting only one frame. In this case, unread logs value will be reset. ***Default value:*** *0x80*
0x32	**PDL_DEL1_RNG** [RW-PS]	2	**Periodic datalogging frame first sending random delay rang** Applied on the 1st frame sending only. Random delay computed in range from min to max: [1st byte] minimum, expressed in [seconds], value <= max [2nd byte] maximum, expressed in [seconds], min <= value NOTE: for repetition delay, see params CNET_DELn_RNG and OTHER_DELn_RNG NOTE: for starting delay, see params PER_FR_START_DEL ***Default value:*** *0x0000 (immediate sending)*
0x33	**PDL_REP** [RW-PS]	1	**Periodic datalogging frame repetition number** Applied whatever the sending mode is. Repetitions stop if ACK/confirmation is received. Corresponds to the number of sendings, not only repetitions). Max value: 10 ***Default value:*** *0x02 (2 frames sent)*
0x34	**PDL_EXT_TOUT** [RW-PS]	1	**Periodic datalogging frame extender timeout** ***Default value:*** *0x01 (1 minute)*

0x35	**PDL_PER** [RW-PS]	2	**Periodic datalogging sending period** Expressed in multiple of 30 seconds. Minimum 30 seconds, maximum 72 hours. ***Default value:*** *0x0078 (1 hour)*
0x36	**PDL_PRTY** [RW-PS]	1	**Periodic dataloging frame priority configuration** NOTE: This is an advanced parameter to be managed by INEO-SENSE team. Priority level of periodic picture frames in OTOTx service: 0x00 … High priority. If transmit list is full, remove the oldest low priority. If no low priority in list then frame is not buffered. 0x01 … Low priority. If transmit list is full, remove the oldest low priority. If no low priority in list then frame is not buffered. 0x02 … High priority. If transmit list is full, remove the oldest low priority. If no low priority in list then remove the oldest high priority. 0x03 … Low priority. If transmit list is full, remove the oldest low priority. If no low priority in list then remove the oldest high priority. 0x04 … High priority. If transmit list is full, frame is not buffered. 0x05 … Low priority. If transmit list is full, frame is not buffered. ***Default value:*** *0x01*

6.2.5 Periodic event list frame parameters

Param ID	Name	Size	Description
0x37	**PEL_TYPE** [RW-PS]	1	**Periodic event list frame default type** Corresponds to the frame type described in section **Erreur ! Source du renvoi introuvable.**. 0x00....Disabled 0x01....Short periodic datalogging frame 0x02....Standard periodic datalogging frame 0x03....Long periodic datalogging frame 0x04....Special periodic datalogging frame ***Default value:*** *0x00 (Disabled)*
0x38	**PEL_MODE** [RW-PS]	1	**Periodic event list frame sending mode** 0x00....Clover-Net P2P 0x01....Clover-Net MCT – no ACK 0x02....Clover-Net MCT –ACK 0x03....Clover-Net BCT – no ACK 0x04....Clover-Net BCT – ACK 0x05....Clover-Net Extender service – no ACK 0x06....Clover-Net Extender service – ACK 0x07....LoRaWAN unconfirmed 0x08....LoRaWAN confirmed 0x09....Sigfox – no ACK 0x0A...Sigfox - ACK ***Default value:*** *0x07 (LoRaWAN unconfirmed)*
0x39	**PEL_READ** [RW-PS]	1	**Periodic event list reading mode** b7 .....If set, events marked as read only if frame reception confirmed (in case sending mode can be confirmed) b6-4....Unused b3-0....Event list reading system: 0x0 ...Unread events are sent from oldest on each periodic sending with more than one frame if necessary. 0x1 ...Unread events are sent from oldest on each periodic sending fitting only one frame. 0x2 ...Only most recent unread events are sent (from oldest) on each periodic sending fitting only one frame. In this case, unread events value will be reset. ***Default value:*** *0x02*
0x3A	**PEL_DEL1_RNG** [RW-PS]	2	**Periodic event list frame first sending random delay rang** Applied on the 1st frame sending only. Random delay computed in range from min to max: [1st byte] minimum, expressed in [seconds], value <= max [2nd byte] maximum, expressed in [seconds], min <= value NOTE: for repetition delay, see params CNET_DELn_RNG and OTHER_DELn_RNG NOTE: for starting delay, see params PER_FR_START_DEL ***Default value:*** *0x0000 (immediate sending)*
0x3B	**PEL_REP** [RW-PS]	1	**Periodic event list frame repetition number** Applied whatever the sending mode is. Repetitions stop if ACK/confirmation is received. Corresponds to the number of sendings, not only repetitions). Max value: 10 ***Default value:*** *0x02 (2 frames sent)*
0x3C	**PEL_EXT_TOUT** [RW-PS]	1	**Periodic event list frame extender timeout** ***Default value:*** *0x01 (1 minute)*

0x3D	**PEL_PER** [RW-PS]	2	**Periodic event list sending period** Expressed in multiple of 30 seconds. Minimum 30 seconds, maximum 72 hours. ***Default value:*** *0x0078 (1 hour)*
0x3E	**PEL_PRTY** [RW-PS]	1	**Periodic event list frame priority configuration** NOTE: This is an advanced parameter to be managed by INEO-SENSE team. Priority level of periodic picture frames in OTOTx service: 0x00....High priority. If transmit list is full, remove the oldest low priority. If no low priority in list then frame is not buffered. 0x01....Low priority. If transmit list is full, remove the oldest low priority. If no low priority in list then frame is not buffered. 0x02....High priority. If transmit list is full, remove the oldest low priority. If no low priority in list then remove the oldest high priority. 0x03....Low priority. If transmit list is full, remove the oldest low priority. If no low priority in list then remove the oldest high priority. 0x04....High priority. If transmit list is full, frame is not buffered. 0x05....Low priority. If transmit list is full, frame is not buffered. ***Default value:*** *0x01*

6.2.6 Keep Alive frame parameters

Param ID	Name	Size	Description
0x3F	**KA_TYPE** [RW-PS]	1	**Keep alive frame default type** Corresponds to the frame type described in section **Erreur ! Source du renvoi introuvable.**. 0x00....Disabled 0x01....Short keep alive frame 0x02....Standard keep alive frame 0x03....Long keep alive frame 0x04....Special keep alive frame ***Default value:*** *0x02 (Standard keep alive frame sent)*
0x40	**KA_MODE** [RW-PS]	1	**Keep alive frame sending mode** 0x00....Clover-Net P2P 0x01....Clover-Net MCT – no ACK 0x02....Clover-Net MCT –ACK 0x03....Clover-Net BCT – no ACK 0x04....Clover-Net BCT – ACK 0x05....Clover-Net Extender service – no ACK 0x06....Clover-Net Extender service – ACK 0x07....LoRaWAN unconfirmed 0x08....LoRaWAN confirmed 0x09....Sigfox – no ACK 0x0A...Sigfox - ACK ***Default value:*** *0x07 (LoRaWAN unconfirmed)*
0x41	**KA_DEL1_RNG** [RW-PS]	2	**Keep alive frame first sending random delay rang** Applied on the 1st frame sending only. Random delay computed in range from min to max: **[1st byte]** minimum, expressed in [seconds], value <= max **[2nd byte]** maximum, expressed in [seconds], min <= value NOTE: for repetition delay, see params CNET_DELn_RNG and OTHER_DELn_RNG NOTE: for starting delay, see params PER_FR_START_DEL ***Default value:*** *0x0000 (immediate sending)*
0x42	**KA_REP** [RW-PS]	1	**Keep alive frame repetition number** Applied whatever the sending mode is. Repetitions stop if ACK/confirmation is received. Corresponds to the number of sendings, not only repetitions). Max value: 10 ***Default value:*** *0x02 (2 frames sent)*
0x43	**KA_EXT_TOUT** [RW-PS]	1	**Keep alive frame extender timeout** ***Default value:*** *0x01 (1 minute)*
0x44	**KA_PER** [RW-PS]	2	**Keep alive sending period** Expressed in multiple of 30 seconds. Minimum 30 seconds, maximum 72 hours. ***Default value:*** *0x21C0 (72 hours)*

0x45	**KA_PRTY** [RW-PS]	1	**Periodic keep alive frame priority configuration** NOTE: This is an advanced parameter to be managed by INEO-SENSE team. Priority level of periodic picture frames in OTOTx service: 0x00....High priority. If transmit list is full, remove the oldest low priority. If no low priority in list then frame is not buffered. 0x01....Low priority. If transmit list is full, remove the oldest low priority. If no low priority in list then frame is not buffered. 0x02....High priority. If transmit list is full, remove the oldest low priority. If no low priority in list then remove the oldest high priority. 0x03....Low priority. If transmit list is full, remove the oldest low priority. If no low priority in list then remove the oldest high priority. 0x04....High priority. If transmit list is full, frame is not buffered. 0x05....Low priority. If transmit list is full, frame is not buffered. ***Default value:*** *0x01*

6.2.7 Device Integrity parameters

Param ID	Name	Size	Description
0x57	**DI_EN** [RW-PS]	2	**Device integrity event enabler** Allows to enable the devices integrity surveillance features - **b15-5 [r/w]- Reserved** - **b4 *[r/w]* - REF_REINIT_EN** – Reinitialization of references. References initialization is always executed after an installation process but, if it was already done, it will be launched on new installation only if this bit is set - **b3 *[r/w]* - MAG_EN** – Magnetic field change detection - **b2 *[r/w]* - TILT_EN** - Tilt detection - **b1 *[r/w]* - MS_EN** - Motion/Shock detection - **b0 *[r/w]* - TEMP_EN** - Operating temperature exceed limits ***Default value:*** *0x0001 (operating temperature monitored)*
0x58	**DI_STAT** [RO-P]	2	**Device integrity event state** Gives the current status the devices integrity surveillance features - **b15 *[r]* – MEMS_ACC_DET** – MEMS Accelerometer detected - **b14 *[r]* – MEMS_MAG_DET** – MEMS Magnetometer detected - **b13 *[r]* – TILT_REF_INIT** – Tilt reference set - **b12 *[r]* – MAG_REF_INIT** – Magnetometer reference set - **b11-6 *[r]* - Reserved** - **b4 *[r]* - MAG_DET** - Magnetic field change detection - **b3 *[r]* - TILT_DET** - Tilt detection - **b2 *[r]* - MS_DET** – Motion/Shock detection - **b1 *[r]* - TEMP_HIGH** - Operating temperature exceeds high limit - **b0 *[r]* - TEMP_LOW** - Operating temperature exceeds low limit ***Default value:*** *0x0000 (nothing detected yet)*
0x59	**LOW_BAT_TH** [RW-PS]	1	**Low battery threshold** Defines the remaining battery percentage to activate low battery LED indication (in %, threshold is operated as <=) ***Default value:*** *0x05 (5% battery remaining trigger battery low event)*
0x5A	**LOW_BAT_PER** [RW-PS]	3	**LED low battery blink period** **[1 byte]** defines the continuous LED blink period (in seconds, 0x00 disables it). **[1 byte]** defines the continuous LED blink duration (in multiple of 50ms). **[1 byte]** defines the HW and number of blink: b7-4 Hardware used to indicate the low battery status (Appendix C) b3-0 Number of blinks (LED off duration is the same as LED on) ***Default value:*** *0x140112 (Low bat blink enabled, 2 blinks 50ms every 20 seconds)*
0x5B	**TEMP_L** [RW-PS]	2	**Temperature exceed - low Threshold** Temperature threshold used for operating temperature high limit detection based on Clover-Sense temperature sensor (+/- 2° precision) Expressed in [1/256th degree Celsius] ***Default value:*** *0xEC00 (-20°C)*
0x5C	**TEMP_H** [RW-PS]	2	**Temperature exceed - high Threshold** Temperature threshold used for operating temperature high limit detection based on Clover-Sense temperature sensor (+/- 2° precision) Expressed in [1/256th degree Celsius] ***Default value:*** *0x4600 (+70°C)*
0x5D	**TEMP_PER** [RW-PS]	1	**Temperature sampling period** Temperature sampling acquisition on the Clover-Sense sensor only. Expressed in [30 sec] ***Default value:*** *0x02 (1 min period)*

0x5E	**LAST_TEMP** [RO-V]	2	**Last Temperature value** Last acquired temperature value from Clover-Sense sensor. Expressed in [1/256th degree Celsius] ***Default value:*** *0x1900 (25°C)*
0x5F	**ACTIVITY_PERC** [RO-V]	1	**Activity percentage** Gives the battery consumed Expressed in [%] ***Default value:*** *0x00 (battery is full)*

0x60	**MOT_SH_CONFIG** [RW-PS]	15	**Motion/Shock configuration** Defines a set of configuration registers applied to the accelerometer sensor and to the motion algorithm - ***B0 [r/w] – ACC CONFIG – Accelerometer configuration*** • **b7 – AXIS_ACT** - in case of multiple axes, a '0' means to trig on "OR" a '1' on "AND"; • **b6-3 - Reserved;** • **b2 – AXIS_Z_EN -** use of axis Z; • **b1 – AXIS_Y_EN -** use of axis Y; • **b0 – AXIS_X_EN -** use of axis X; - **B1** ***[r/w] – THRESHOLD - Acceleration trig threshold***. Expressed in [16 mG] - **B2** ***[r/w] – DURATION - Accelerometer trig minimum duration***. Expressed in [40ms]; - ***B3 [r/w] - TS_INC - Motion algorithm Increment value.*** Defines the increment value added to internal motion counter every time movement is detected. If 0x00, motion algorithm is deactivated and detection becomes a simple shock detection. - ***B4 [r/w] - TS_DEC - Motion algorithm Decrement value.*** Defines the decrement value subtracted from internal motion counter if pulse is not detected within certain time. TS_DEC must be lower than TS_INC. - ***B5 [r/w] - TS_V_TH - Motion algorithm Threshold value.*** Defines the maximum internal motion counter value considered as threshold level for movement start. Must be lower than 150. - ***B6 [r/w] - SWT_NM - Switch to No motion state.*** Time to switch to "No Motion" state after motion stops. Expressed in multiple of TS_DEC. - ***B7-8 [r/w] – ON_DELAY - Delay before restarting motion detection after stop.*** Time for suspending Motion sensor activities (in [s]) after Motion Stop event is generated (see **STOP_DELAY** below). If set to 0, Motion sensor activities are not suspended; - ***B9-10 [r/w] – START_DELAY – Delay before generating Motion Start event after Start motion was detected.*** Time after movement starts (in [s]), which generates Motion start event. If set to 0, event is processed immediately after Motion algorithm detects motion start; - ***B11-12 [r/w] – CONT_DELAY – Delay before generating Continuous Motion event during motion.*** Time with continuous movement (in [s]) to trigger Motion continuous event (each event detection reloads the continuous motion time). Min. time allowed is 60s. If set to 0, Motion continuous event is disabled; - ***B13-14 [r/w] – STOP_DELAY – Delay before generating Motion Stop event after motion stop.*** Time with no movement (in [s]), which generates Motion stop event. If set to 0, event is processed immediately after Motion algorithm detects motion stop; Expressed in multiple of seconds. If sensor must work as Shock detector next settings must be done: TS_INC=2, TS_DEC=1, TS_TH_V=1, SWT_NM=0 and in THRESHOLD to be assigned desired sensitivity. ***Default value:*** *0x07020205010F00000000000000*

0x69	**CORE_FL** [RO-P]	2	**Clover-Core internal flags** *Expert use only. These flags are persistent, they are never reset by Clover-Core.* b15 .. A reset of transceiver has been forced b14-9Unused b8-7 ... Auto-transmit critical issue code 0x0. No issue detected 0x1. Unknown sending type 0x2. Element in transmission lost 0x3. Element in delay lost b6 .... Auto-transmit engine has reached max b5 .... Periodic auto-transmit engine has reached max b4 .... Stamping timer engine has reached max b3 .... Application timer engine has reached max b2 .... Stack timer engine has reached max b1 .... Application queue has reached max b0 .... Stack queue has reached max **Default value:** 0x0000
0x6A	**CORE_FLD** [RO-V]	2	**Clover-Core dynamic internal flags** *Expert use only. These flags are dynamic,* b15-1Unused b0 .... Auto-transmit engine full **Default value:** 0x0000

7 General FAQ

7.1 Real Time Clock format

Real Time Clock (RTC) is organized as 4 Bytes second counter that counts seconds according 1st of January, 2010 00:00:00.

7.2 Motion management

In MOT_SHO_CONFIG there are set of fields (**TS_INC**, **TS_DEC**, **TS_TH_V** and **SWT_NM**), which define sensor sensitivity.

To add additional level on Motion filtering (to avoid event generation of Motion Start/Stop events on small motion state changes) set of delays is included in generic parameter MOT_SHO_CONFIG. Every one of them defines time between motion state change detection and generation of corresponding events:

- START_DELAY – defines delay before generating Motion Start event, once motion was detected;
- CONT_DELAY – defines how much time device must be in motion before sending Motion Continuous event. Once such event is generated new CONT_DELAY time is reloaded and generation of this event continue until motion stop;
- STOP_DELAY – define how much time have to pass after real motion stop before generating Motion Stop event. Generation of Motion Stop event terminate cycle for Continuous Movement events.

If Motion stop before Motion Start event is generated, it is considered that there was no motion at all (i.e. there is no Motion Stop event too).

If Motion stop and then restart before Motion Stop is generated, it is considered there is no motion stop and motion continues.

In addition to mentioned above delays, there is one more – ON_DELAY. It defines will be there Motion sensor suspend after Motion Stop event is generated and how long it will be (if set). If there is, Motion sensor is suspended until this time expire (i.e. no motion will be detected during this time) and then is resumed again.

Tilt and Motion/Shock management are mutually exclusive, so when Tilt management is enabled, Motion/Shock cannot be enabled.

There are specific settings, described in parameter MOT_SHO_CONFIG, which allow sensor to be used as Shock detector. However, for the moment even if they are set Shock will be reported as Motion event.