

Signal Telegram (input to EEP-specification)

Signal Telegram V2.7

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TABLE OF CONTENT

1. REVISION HISTORY	2
2. INTRODUCTION	2
3. Signal Telegram	3

1. REVISION HISTORY

The following major modifications and improvements have been made to the first version of this document:

No	Date	Editor	Major Changes
V2.3	Dec 04, 2017	TMe, MHo	Conclusion of discussion during TWG-Workshop at Oberhaching, Germany; version for TWG-review
V2.4	Jan 25, 2018	MHo	Modifications following TWG-review; approved version (TWG-Call Jan 25, 2018)
V2.5	Feb 01, 2018	NMe	Official version following TWG-approval
V2.6	Mar 14, 2018	NMe	Errors corrected (MID 0x07, MID 0x0A), column <i>Bitrange</i> removed from each table;
V2.7	Dec 10, 2018	MHo	Added MID 0x0E, 0x0F – TX mode on/off

2. INTRODUCTION

This document defines the concept of the Signal Telegram (Sig Telegram).

This concept is to be understood in combination with the valid version of the EEP-specification (at time of approval: EEP 2.6.8).

This concept will be integrated into chapter 3 of the structure of the EEP-specification.

Signal Telegram (input to EEP-specification)

This document is owned by and progressed by the Technical Working Group (TWG) of the EnOcean Alliance. The chairman of the TWG is in charge for updating and storing of this document as well as for notification of TWG members.

This document is to be stored in the webspace of the TWG / documents / specification. It will be removed and deleted once the EEP-specification including the chapter *Signal Telegram* will be published.

3. Signal Telegram

3.xx.1 General description

Signal Telegram as a feature is dedicated to signalize special events with optional data, trigger actions or request responses. It extends the functionality of the device independently of used EEPs or other communication profiles.

Target key functional fields are:

- Communication flow control
- Energy harvesting and reporting
- Failure & issues reporting
- Radio link quality reporting

Signal telegram has a dedicated RORG defined (0xD0). The payload definition of its content is depended on the first payload byte – message identifier - MID. Specific MID values define all aspects of the meaning of the payload data, following actions and resulting conclusions for the device application.

Signal telegram can be transmitted in both directions. Communication direction, addressing and other underlying protocol features are defined based on specific MID case by case.

Signal telegram transmission and features can be executed at any time of the device operation. Specific rules or aspects are defined case by case by MID or device application.

3.xx.1.1 Interaction to other protocols

Feature definition and use cases of signal telegram shall not interfere or redefine application use cases defined in EEPs or other specifications (e.g. ReCom, REMAN and Security). Signal telegram is aimed to extend and enable specialized use cases or boundary use cases not fitting to a major protocol definition.

All features and actions defined in this chapter shall, however, have a closed character inside this specification to the highest possible degree. Meaning responses or actions shall be described in this chapter (e.g. request level status & response energy level) or clearly referencing interfaces to other specification (e.g. Smart ACK Mailbox empty signal).

Signal telegram definition does not follow the EEP Structure of FUNC & TYPE and it does not rely on the teach-in / data telegram concept. Signal telegram does not define and/or require a teach-in.

3.xx.1.2 Requirements on devices supporting Signal telegram features

Each device supporting the Signal telegram features has to state it inside the Device Description file – DDF and list the specific MID which are supported by the device, if DDF is available.

Fulfillment of the defined features of the signal telegram in this chapter shall become an independent certification specification.

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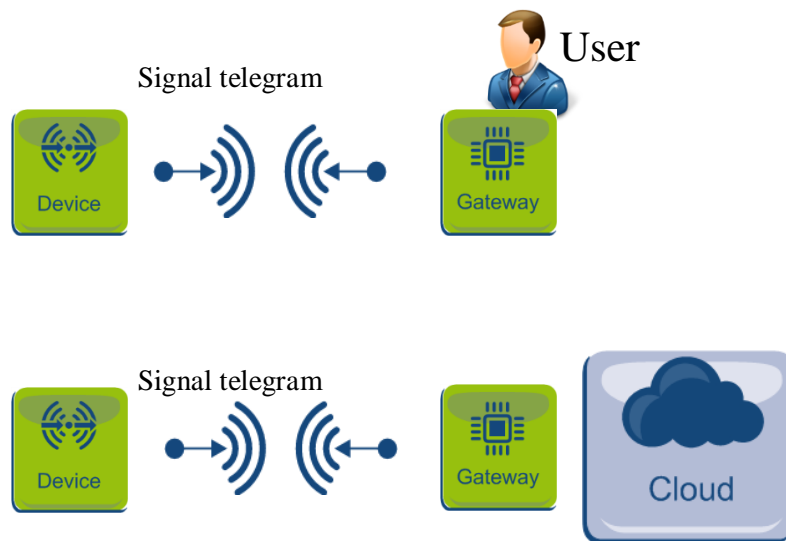
3.xx.1.3 Future development of Signal Telegram

Definition of new MID and new use cases is matter of a TWG approval. New submissions shall be first submitted to the EAC for quality assurance. A similar process applies as for new EEPs.

Adding additional data fields or redefining structurally existing fields of MID defined already is not allowed. A similar process as for new EEPs applies. An allowed extension - after approval of EAC ! - is to extend lists with reserved fields (e.g. IDX4 trigger request).

3.xx.1.4 Typical use case scenario

There is no strict rule which device may or may not send or receive Signal telegrams. However, the typical use case is between a field-end device and constantly powered gateway device working autonomously or constantly powered commissioning device operated by a user.



3.xx.2 Telegram definition

Telegram Definition: R-ORG 0xD0

Offset	Size	Data	Short-Cut	Description
0	8	Message index	MID	<u>Enumeration:</u> 0x00 – NOT USED 0x01 - 0xFF: See chapter below

Signal Telegram (input to EEP-specification)

8	n	Optional defined by MID	ADI	Optional data, based on MID
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Defined MID overview:

MID	Name	Optional Data
0x00	Reserved	
0x01	Smart Ack Mailbox empty	NO
0x02	Smart Ack Mailbox does not exist	NO
0x03	Smart Ack Reset: Trigger LRN Request	NO
0x04	Trigger status message of device	YES
0x05	Last unicast-message acknowledge.	NO
0x06	Energy status of device	YES
0x07	Revision of device	YES
0x08	Heartbeat,	NO
0x09	RX-window open	NO
0x0A	RX-channel quality	YES
0x0B	Duty-cycle status	YES
0x0C	Configuration of device changed	NO
0x0D	Energy delivery of the harvester	YES
0x0E	TX Mode off	NO
0x0F	TX Mode on	NO
0x10- 0xFF	Reserved	

MID 0x01 Smart Ack Mailbox empty

Originator: Constantly powered Smart Acknowledge Postmaster

Addressing: Broadcast / Unicast

For details refer to the Smart Acknowledge specification, please.

Offset	Size	Data	Short-Cut	Description
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Signal Telegram (input to EEP-specification)

0	8	Message index	MID	<u>Enumeration:</u> 0x01 – Smart Ack Mailbox empty
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Signal Telegram (input to EEP-specification)

MID 0x02 Smart Ack Mailbox does not exist

Originator: Constantly powered Smart Acknowledge Postmaster
Addressing: Broadcast / Unicast

For details refer to the Smart Acknowledge specification, please.

Offset	Size	Data	Short-Cut	Description
0	8	Message index	MID	<u>Enumeration:</u> 0x02 – Smart Ack Mailbox does not exist

MID 0x03 Smart Ack Reset: Trigger LRN Request

Originator: Constantly powered device.
Addressing: Unicast (addressed to Sensor)

For details refer to the Smart Acknowledge specification, please.

Offset	Size	Data	Short-Cut	Description
0	8	Message index	MID	<u>Enumeration:</u> 0x03 – Smart Ack Reset: Trigger LRN Request

MID 0x04 Trigger status message of device

Originator: Constantly powered device.
Addressing: Unicast - addressed to End Device.

(Because after broadcasting this message all sensors would try to answer and jam the channel)

With this telegram an explicit request of a status message is triggered. Various status messages can be triggered. Which status is requested is explicitly listed in the optional data. See table below.

When triggering RX channel quality the receiver shall take the telegram request itself as the subject of evaluation. The dBm value is the RSSI-value of the request received.

With EEP status message specific data content is defined by the used EEP and depends on the device. Trigger EEP Status shall NOT replace requests messages in EEP Telegrams.

Responses triggered by this request shall be addressed to the requesting EURID device. If requested message is not available there is no RESPONSE.

Signal Telegram (input to EEP-specification)

Offset	Size	Data	Short-Cut	Description
0	8	Message index	MID	<u>Enumeration:</u> 0x04 – Trigger status message of device
8	8	Trigger details	TRG	<u>Enumeration:</u> 0x00 – EEP Status. (Response: Defined by device) 0x01 – Energy status (Response: MID 0x06) 0x02 – Revision of device (Response: MID 0x07) 0x03 – RX Level of received request (this telegram (Response: MID 0x0A) 0x04 – Energy current harvested reporting (MID 0x0D) 0x05 – 0xFF – RESERVED

MID 0x05 Last unicast-message acknowledge

Originator: Device.

Addressing: Unicast – addressed to originator.

This message is sent after an unicast message addressed to the device was successfully received. Turning off / on of this debug reporting is executed via ReCom configuration parameters.

NOTE: This ACK reports last unicast was received and the HASH check was successful.

Offset	Size	Data	Short-Cut	Description
0	8	Message index	MID	<u>Enumeration:</u> 0x05 - Last unicast-message acknowledge

Signal Telegram (input to EEP-specification)

MID 0x06 Energy status of the device

Originator: Device.
Addressing: Recommend broadcast.

The value in optional data corresponds to the typical operating time of this device.

Offset	Size	Data	Short-Cut	Description						
0	8	Message index	MID	<u>Enumeration:</u> 0x06 – Energy status of device						
8	8	Energy	ERG	<table border="1"> <thead> <tr> <th>Valid Range</th> <th>Scale</th> <th>Unit</th> </tr> </thead> <tbody> <tr> <td>1..100</td> <td>1..100</td> <td>%</td> </tr> </tbody> </table>	Valid Range	Scale	Unit	1..100	1..100	%
				Valid Range	Scale	Unit				
				1..100	1..100	%				
0: last message due to power loss. Gasp of death.										
101 – 255: Reserved.										

MID 0x07 Revision of the device

Originator: Device.
Addressing: Recommend broadcast.

Value in optional data corresponds to the HW and SW version of this device. HW version and SW tracking is manufacturer specific.

Offset	Size	Data	Short-Cut	Description
0	8	Message index	MID	<u>Enumeration:</u> 0x07 – Revision of the device
8	32	SW Version	SWV	SW version of the device. VA.B.C.D = 0xAABBCCDD (e.g. V 1.2.3.4 = 0x01020304) AA- Most significant (Major version)
40	32	HW Version	HWV	HW version of the device. VA.B.C.D = 0xAABBCCDD (e.g. V 1.2.3.4 = 0x01020304) AA- Most significant (Major version)

Signal Telegram (input to EEP-specification)

MID 0x08 Heartbeat

Originator: Device
Addressing: Recommended broadcast.

This is the “still alive message”, only for devices not transmitting information via EEPs/GP, e.g. repeater, tag. Trigger events of heartbeat and periods between heartbeat is described inside the DDF.

Offset	Size	Data	Short-Cut	Description
0	8	Message index	MID	<u>Enumeration:</u> 0x08 – Heartbeat

MID 0x09 RX Window open

Originator: Device
Addressing: Recommended broadcast.

Inform the receiver in radio coverage that the device is available for RX Period. RX Period might end earlier because an addressed message was received or out of energy reasons. Exact RX period is application specific and is defined in the DDF of the device.

RX windows is started after first sub telegram was transmitted.

Offset	Size	Data	Short-Cut	Description
0	8	Message index	MID	<u>Enumeration:</u> 0x09 – RX Window open

Signal Telegram (input to EEP-specification)

MID 0x0A RX-channel quality

Originator: Device.

Addressing: Recommend broadcast.

This telegram provides debug information about the link quality of a specific radio link. Which radio link (Device A to Device B) is reported depends on the device application. It can report all received telegrams or only telegrams in filter list or Inbound or Outbound link table.

With signal telegram (MID 0x04) request / response can be triggered to report the link quality of the request.

Turning off / on of this debug reporting is executed via ReCom configuration parameters.

Offset	Size	Data	Short-Cut	Description		
0	8	Message index	MID	<u>Enumeration:</u> 0x0A – RX-channel quality		
8	32	ID	ID	32 – bit communication EURID of the telegram the quality is reported		
40	8	DBM Worst	ADI_W	Valid Range	Scale	Unit
				0..254	127..-127	dBm Worst
				255	Value UNKNOWN	
48	8	DBM Best	ADI_B	Valid Range	Scale	Unit
				0..254	127..-127	dBm Best
				255	Value UNKNOWN	
56	4	Subtelegram count	ST_C	<u>Enumeration:</u> 0x0 VALUE UNKNOWN 0x1 One sub telegram received during RX maturity time defined in ERP. ... 0xF Fifteen or more sub telegrams received during RX maturity time defined in ERP.		
60	4	Max Repeater Level	RL	<u>Enumeration:</u> 0x0 Max Repeater Level 0 received 0x1 Max Repeater Level 1 received 0x2 Max Repeater Level 2 received 0x3 - 0xE values reserved 0xF – VALUE UNKNOWN		

Signal Telegram (input to EEP-specification)

MID 0x0B Duty cycle status

Originator: Device
Addressing: Recommended broadcast.

This is the flag to signal the device status of duty cycle lock / limit on radio communication due to limitation of the TX duty cycle lock requested by the radio certification authorities. Once the device will resumes its operation it may send "TX Duty cycle status" message with corresponding payload.

Offset	Size	Data	Short-Cut	Description
0	8	Message index	MID	<u>Enumeration:</u> 0x0B – Duty cycle exceeded
8	4	Status flag		0x0 – TX Duty cycle limit exceeded. Further communication is not possible. 0x1 – TX Duty cycle is available. Communication can resume. 0x2 – 0xF – Reserved.
12	4			Not used

MID 0x0C Configuration of device changed

Originator: Device
Addressing: Recommended broadcast.

Once the device is configured by local user interface this command informs surrounding gateway about this event. Fetching the changes/updates is then the matter of EEP related communication or ReCom. This is solely the signal to the connected gateway something has changed.

Offset	Size	Data	Short-Cut	Description
0	8	Message index	MID	<u>Enumeration:</u> 0x0C – Configuration of device changed

Signal Telegram (input to EEP-specification)

MID 0x0D Energy delivery of the harvester

Originator: Device.
Addressing: Recommend broadcast.

The value in optional data reports the energy output from the energy harvester (e.g. from a solar cell or thermos harvester) at this time. It provides an indication on how good the current position of the EH device is and provides an indication of the performance for future operation. Therefore, only a simple indication is provided.

During operation mode the MID 0x06 should be used to monitor energy status.

Offset	Size	Data	Short-Cut	Description
0	8	Message index	MID	<u>Enumeration:</u> 0x0D – Current delivery of the harvester
8	4	Charging capabilities	CHC	<u>Enumeration:</u> 0x00 – Energy provided form harvester is very good for future operation. 0x01 – Energy provided form harvester is good for future operation. 0x02 – Energy provided form harvester is average for future operation. 0x03 – Energy provided form harvester is bad for future operation. 0x04 – Energy provided form harvester is very bad for future operation.
12	4			<u>Not used</u>

MID 0x0E TX Mode OFF

Originator: Device.
Addressing: Recommend broadcast.

This message informs about the fact that the device is entering a mode where no further radio communication will be executed until the device exits this mode.

The use case if for example :

- transport regulations (no radio communication during air transport) or
- the device is put to storage without continuous source of ambient energy source.
- EH device is entering power save mode
- or others

Exit of transport / storage mode is application specific.

Offset	Size	Bit-range	Data	Short-Cut	Description
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Signal Telegram (input to EEP-specification)

0	8	DB0.0 - DB0.7	Message index	MID	<u>Enumeration:</u> 0x0E – TX MODE OFF
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MID 0x0F TX Mode ON

Originator: Device.

Addressing: Recommend broadcast.

This message informs about the fact that the device is now exiting a previous TX MODE OFF. TX Mode will be now available as in normal operation.

The usage of this MID is optional and mandatory connected to the MID 0x0E. Device which send MID 0x0E are not required to send MID 0x0F.

Offset	Size	Bit-range	Data	Short-Cut	Description
0	8	DB0.0 - DB0.7	Message index	MID	<u>Enumeration:</u> 0x0F – TX Mode ON