

Gateway Controller Firmware for
TCM 300 / TCM 300C
TCM 320 / TCM 320C

February 13, 2012



REVISION HISTORY

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

No	Major Changes
1.0	Initial version
1.01	Type 3 commands removed from serial interface description
1.02	Modified for firmware version 2.1.0.0: number of Smart Ack mailboxes increased to 15
1.03	Modified for firmware version 2.2.0.0 READY event after wake-up from sleep; baud rate corrected: 58823 bit/s instead of 57600 bit/s.
1.04	Editorial changes
1.05	Modified for firmware version 2.4.0.0: number of Smart Ack mailboxes increased to 20 and number of filters increased to 30
1.06	Additional information in 2.2

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Important!

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1 GENERAL DESCRIPTION

1.1 Basic functionality

The Gateway Controller firmware enables the realization of gateways for the EnOcean 868 MHz and 315 MHz radio systems. It provides a bi-directional radio interface on one end and a bi-directional serial interface with a baud rate of 58.8 kbit/s at the other end. Radio messages are sent transparently through the serial interface in both directions from and to an externally connected host processor or host PC. In addition control commands can be sent from the host to manage the Gateway Controller functions, e.g. to configure the repeater functionality or to manage the Smart Ack functions. Gateway Controller can act as postmaster for up to 20 bi-directional sensors using Smart Ack technology.



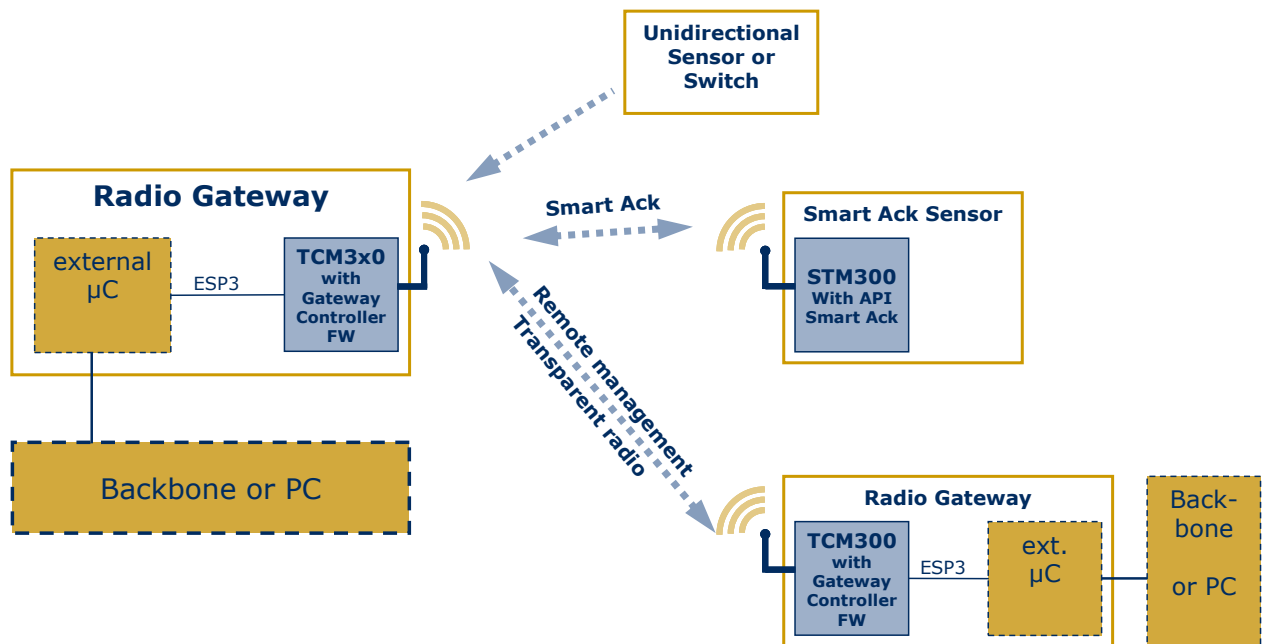
The Gateway Controller firmware can be installed in TCM 300/300C and TCM 320/320C radio modules.

Features

- Smart Acknowledge Controller functionality
- Transparent radio channel
- Programmable repeater functionality (1 / 2 Level)
- ESP3 (EnOcean Serial Protocol V3) support

System environment

In the figure below, Gateway Controller is shown in a typical system environment.



2 FUNCTIONAL DESCRIPTION

2.1 I/O description

For pin out and hardware related details please refer to the TCM 3xy user manual.

Symbol	Function	Characteristics
ADIO0 – ADIO5	Not used	Digital input, internal pull-up
ADIO6	SER_RX	UART input
ADIO7	SER_TX	UART output
	Programming I/F	
SCSEADIO0	Not used	Digital input, internal pull-up
	Programming I/F	
SCLKDIO1	Not used	Digital input, internal pull-up
	Programming I/F	
WSDADIO2	Not used	Digital input, internal pull-up
	Programming I/F	
RSDADIO3	Not used	Digital input, internal pull-up
	Programming I/F	
WXIDIO	Not used	Digital input, internal pull-up
WXODIO	Not used	Digital input, internal pull-up

2.2 Serial interface

Gateway Controller provides a bi-directional serial interface which conforms to the ESP3 specification. For details regarding ESP3 please refer to the ESP3 specification. The data rate on the serial interface is 58.8 kbit/s which is usually interoperable with systems running on 57.6 kbit/s.

Direction	Nominal serial data rate	Tolerance
TX (sent by module)	58823 bit/s (=57600 bit/s + 2.1%)	< 50 ppm
RX (received by module)	58823 bit/s	< 5%

The following ESP3 commands are supported:

- Type 1 Radio command for transparent mode
- Type 2 Responses
- Type 4 Event
 - SA_CONFIRM_LEARN to confirm/discard learn in/out
 - CO_READY to indicate wake up from deep sleep initiated by CO_WR_SLEEP
- Type 5 Common commands
 - CO_WR_SLEEP to enter energy saving mode (deep sleep mode)
 - CO_WR_RESET to reset the device
 - CO_RD_VERSION to read SW/HW versions, chip ID etc.
 - CO_RD_SYS_LOG to read system log from device data base
 - CO_WR_SYS_LOG to reset system log from device data base
 - CO_WR_BIST to perform flash BIST operation
 - CO_WR_IDBASE to write ID range base number

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- CO_RD_IDBASE to read ID range base number
- CO_WR_REPEATER to configure repeater functionality
- CO_RD_REPEATER to read repeater state
- CO_WR_FILTER_ADD to add filter to filter list (up to 30 filters are supported)
- CO_WR_FILTER_DEL to delete filter from filter list
- CO_WR_FILTER_DEL_ALL to delete all filter
- CO_WR_FILTER_ENABLE to enable/disable supplied filters
- CO_RD_FILTER to read supplied filters
- CO_WR_WAIT_MATURITY to wait maturity time before returning radio telegrams
- CO_WR_MEM for writing into memory
- CO_RD_MEM for reading memory
- CO_RD_MEM_ADDRESS to get addresses of special areas
- Type 6 Smart Acknowledge commands
 - SA_WR_LEARNMODE to set/reset Smart Acknowledge learn mode
 - SA_RD_LEARNMODE to get learn mode
 - SA_WR_LEARNCONFIRM to add or delete a mailbox of a client
 - SA_WR_RESET to send a reset command to a client
 - SA_RD_LEARNEDCLIENTS to get learned mailboxes/clients
 - SA_WR_POSTMASTER to activate/deactivate post master functionality
- Type 7 Remote Management messages up to 256 Bytes



All configuration values set via ESP3 commands are held in RAM and will therefore be lost after RESET or after a deep sleep phase. Only Smart Ack mailboxes are stored in FLASH and are available also after RESET or a deep sleep phase.



After sending a CO_WR_RESET command, the following CO_READY event indicates wake up reason 06 meaning "A memory request from the CPU core does not correspond to any valid memory location." This is caused by the real reset cause used when CO_WR_RESET will be performed. It is not a SW/HW malfunction.

2.3 Built-in Repeater

Gateway Controller provides the option to activate a one or two-level repeater for EnOcean radio telegrams.

1-level repeater: If a received telegram is a valid and original (not yet repeated), the telegram is repeated after a random delay.

2-level repeater: If a received telegram is valid and original or repeated once, the telegram is repeated after a random delay.



2-level repeating function should only be activated if really needed! Otherwise the system function can be compromised by collisions of telegrams.

The repeated telegram is marked as "repeated" by an increased repeater counter. Configuration of the repeater is done via serial interface commands.

For detailed recommendations regarding the usage of repeaters please refer to our application note [EnOcean Wireless Systems - Installation Notes \(PDF\), 09/2010](#).

2.4 Smart Acknowledge

Gateway Controller provides a post master function with 20 mailboxes for sensors using Smart Ack technology. For more information on smart acknowledge please refer to [EnOcean Equipment Profiles \(EEP\) V2.1](#).



When teaching-in a device using Smart Acknowledge please take care to switch off all TCM 3xy devices which are not continuously powered. Otherwise these TCM 3xy modules could be declared postmaster. As soon as the power supply is switched off, a postmaster would be missing and Smart Acknowledge would not work any longer!

2.5 Remote Management

Gateway Controller provides a transparent radio channel also for remote management messages with a message length of up to 256 bytes. This enables an external micro controller connected to Gateway Controller to handle remote management request from external devices or to control other devices via remote management. For more information on remote management please refer to [EnOcean Equipment Profiles \(EEP\) V2.1](#).