

RF ID Sensor

Version 1.0

**Address
and
Command Structure**

NXT-G block

1. Address and Command Structure

The RF ID sensor has a hard wired address of 4 for the I2C communication.

As any digital LEGO sensor, the RF ID sensor is treated like an external memory from which data can be read and to which data can be written. Subsequent there is a memory map of the application firmware and its specifics for operating the RF ID sensor. All commands are shown italic and underlined.

| Address | length | content | Description |
|-----------------------------------|----------|----------------|---|
| 00h | 5 | V1.0 | Version number of the firmware |
| 08h | 8 | CODATEX | Manufacturer name |
| 10h | 8 | RFID | Sensor type |
| 32h | 1 | 0..1 | Sensor status info |
| <u>41h</u> | <u>1</u> | <u>1...255</u> | <u>Command to the RF ID sensor</u> |
| Following commands are available: | | <u>0</u> | Stop RF ID sensor, will stop reading and put RF ID sensor into sleep mode |
| | | <u>1</u> | Single read, will start a single read action, if any transponder is readable, the data will be read and stored in registers 42h to 46 h. Immediately after reading a transponder or after a max wait time of app. 0,5 seconds the sensor will enter the sleep mode. |
| | | <u>2</u> | Continuous read, the sensor will continuously read and store data in registers 42h to 46h! After app. 2 sec. of inactivity on the I2C bus the sensor will enter the sleep mode! |
| | | <u>81</u> | Start the bootloader |
| 42h | 1 | 1...255 | 1 st byte of transponder data |
| 43h | 1 | 1...255 | 2 nd byte of transponder data |
| 44h | 1 | 1...255 | 3 rd byte of transponder data |
| 45h | 1 | 1...255 | 4 th byte of transponder data |
| 46h | 1 | 1...255 | 5 th byte of transponder data |
| | | | |

The bootloader has its individual memory map:

| Address | length | content | Description |
|------------|----------|----------------|------------------------------------|
| <u>41h</u> | <u>1</u> | <u>1...255</u> | <u>Command to the RF ID sensor</u> |
| Command: | | <u>83h</u> | Start the application firmware |

| | | | |
|-----|----|------------------|---|
| A0h | 16 | 1234567890ABCDEF | 16 byte serial number of the RF ID sensor |
| | | | |

For reading the serial number of the RF ID sensor one has to start the bootloader by writing to address 41h the command 81h and then reading the serial number from address A0h.

2. NXT-G Block

The NXT-G block is used in the LEGO MINDSTORMS graphical programming language NXT-G as a command to communicate with the RF ID sensor. For each new sensor a new block has to be imported into NXT-G using a special block import tool.

The block appears in NXT-G as an icon, which shows some information about the configuration of the block. For wiring the inputs/outputs of a block there is a pull down data hub.

The block is configured in a configuration panel, which appears at the bottom of the NXT-G window, when a block is selected.

There is also a help function for each block providing more details of how to use the block and its wires on the data hub.

The RF ID sensor block has following features:

ICON:

- shows on the top right to which port the sensor is connected
- shows on the bottom left which mode of operation has been selected in the configuration panel

DATA HUB:

- inputs:
 - o port selection
 - o command
- outputs:
 - o port selection
 - o command
 - o Text wire providing 5 byte transponder ID number in Hex code
 - o 5 Numeric wires for each byte of transponder ID number
 - o True/false wire for ID number match
 - o Status wire
 - o Error wire

CONFIGURATION PANEL:

- Port selector

- selector for the command
- serial number window
- life ID number window
- Compare to ID window

HELP FILE

- detailed description of sensor functions and specialities

a. NXT-G block operation

The operation of the NXT-G block has certain specialities due to the dedicated hardware/firmware of the RF ID sensor.

The RF ID sensor firmware is using a watch dog, which puts the sensor into sleep mode after 2 seconds of inactivity on the I2C lines. As a wake up from the sleep mode a "dummy" command on the I2C lines must be used.

As the timing of how the block is used in the NXT-G program is not known, there are provisions in the block software for proper function:

- first action of a block must be a "dummy" wake up command, as it is not known if the sensor is in sleep mode or not!
- After the default wake up command further execution depends on the command selected in the configuration panel and on the previous mode of operation:
 - o STOP command
 - Write stop command to sensor
 - o SINGLE READ command
 - Write single read command
 - Wait for 250 msec for RF set up time
 - Read transponder data from register
 - o CONTINUOUS READ command
 - Read status register 32h
 - IF status byte=0
 - Write Continuous read command
 - Wait for 250 msec for RF set up time
 - Read transponder data from register
 - IF status byte=1
 - Read transponder data from register

Above features are already integrated in the current version of the NXT-G block.