

R-OEM-LF-M800

125 kHz OEM RFID Module

Installation and Operation Manual

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1 Introduction

This manual describes the communication protocol of these devices:

Embedded Modules

R-OEM-LF-M800-TTL
R-OEM-LF-M800-232
R-OEM-LF-M820-USB
R-OEM-LF-M820-232

Card Readers

R-DT-EVO-LF

2 Communication Protocol

Important Note

The R-OEM-LF-M800-485 uses a different communication protocol and cannot be operated with the software described in this manual.

2.1 Preface

The baud rate of the serial is fixed and equal 9600; the number of bits per character is always 8, there is no parity and 1 bit of stop is designated. The commands can also be issued using a terminal program. The data is transmitted as ASCII characters that can be displayed on any terminal program (e.g. hterm, TeraTerm, PuTTY).

2.1.1 Syntax

In this document all control characters are written in bold-style (ex. CR corresponds on booting in serial to the value 13dec or rather 0Dhex). The constant alphanumerical strings are indicated between quotation marks (ex. "3"). The variable parameters are concluded between the characters < e >, the signification of the parameters will be specified after the description of each command

2.1.2 Structure of the Commands

This protocol has been developed for a very simple administration of the communication. Generally the commands and the answers are forwarded as single ASCII characters and the controller adds CR + LF (Carriage Return + Line Feed) to each answer.

Example

"X" <Data>

CR character ASCII 13dec (0D hex) for Carriage Return.

LF character ASCII 10dec (0D hex) for Line Feed.

2.1.3 Commands

In the following table are specified all the commands that are accepted from the controller. On each command the controller responds to the host apart from explicit indicated cases. The activation of the green led indicates the correct execution of a reading or writing command.

Command Table

CMD	Description
'x' or 'z'	Reset
'v'	Version request
'c'	Reading continues
'l'	Login
'r'	Read page
'w'	Write page
'd'	Denomination of LED
'p'	Antenna power off

2.1.4 Error codes

The following table shows all error messages returned from the controller.

Code	Description
'?	Invalid command
'N'	Command not executed
'S'	Continuous read stopped

2.2 Command Descriptions

2.2.1 Reset "x" or "z"

This command executes a reset software. The forwarding of this command causes a reset of the controller and of possible transponders in the reading-zone.

If the command has been received correctly, the controller answers as following:

- "MULTITAG-125 a.01" CR LF and enters into the continuous read mode.

2.2.2 Get Version "v"

This command requests the currently implemented firmware from the controller.

If the command has been received correctly, the controller answers as following:

- "MULTITAG-125 a.01" CR LF

2.2.3 Continuous read (default function mode after power on) "c"

Following this command, the controller reads and forwards continuously the serial number of the transponder that remains in the reading zone. This command can be interrupted by forwarding any character to the controller. The reader supports different types of tags even if only one type of tag at a time can be identified.

In this reading mode the controller effects a fast scanning of all the designated tags and forwards the serial number of the identified tag via serial-line.

If the command has been received correctly, the controller answers as following:

- <IdType> <SerialNumber>

<IdType>

One-digit character string identifies the single type of the tag. Can be used in order to determine the type of the tag presented to the reader and control tag specific commands. The different types of supported transponders have UID in different lengths, for example the tags EM4x02 use an UID of 5 bytes whereas Hitag 1 and Hitag 2 use only 4 bytes.

The following table shows a list of specified IdType of all the supported tags

IDType	Designation	Length UID
"U"	EM 4x02, 5551 (Q5)/5567 &read-only emulation	5 bytes
"T"	EM 4x50, Titan	4 bytes
"Z"	ISO FDXB	8 bytes
"h"	HITAG 1, Hitag S	4 bytes
"H"	HITAG 2	4 bytes

<SerialNumber>

n-digit alphanumerical string.

2.2.4 Login "l" <Password>

This command is necessary for the authentication for tags of the type EM 4x50 and HITAG 2.

For the transponder EM 4x50 the command signification of the Login is the same as described on the datasheet of this transponder: it is necessary to forward the Login-command followed by the Password in order to have access to the protected memory area. For example it is necessary to forward this command in order to execute the scripture of the password onto the transponder of the type EM4X50. Keep in mind that, as described in the respective datasheet, the password on EM4X50 is the Long word n°00 and that it cannot be read but only written if it (the current) is known.

For the transponder HITAG2 it is necessary to know the password before any access in reading or writing is possible. In both cases the login is affected automatically with the default values based on the ultimate identified type of tag.

<Password> 4-bytes alphanumerical string represents the code used for the login

If the command has been received correctly, the controller answers as following:

- "L" CR LF In case of successfully effected login
or
- "N" CR LF In case of Error. Password wrong or tag removed from the reading zone

2.2.5 Read page "r" <PageAddr>

This command allows the reading of a block of data of a tag. The dimension of the data returned by an answer depends on the type of tag used. The valid values of the number of the requested page depend also on the type of tag in use. The reading command of page 00 in case of tags of the type EM 4x02 and ISO FDXB returns the serial number of the tag.

<PageAddr> 1-byte numerical string represents the number of the page to read

If the command has been received correctly, the controller answers as following:

- <IdTipo><SerialNumber> CR LF In case of correctly received reading
or
- "N" CR LF In case of Error or tag removed from the reading zone

2.2.6 Write page "w" <PageAddr> <Data>

This command allows the writing of a block of data of a tag. After typing in the data, they will be automatically re-read in order to verify the correct writing. Not all types of tags support the writing.

- <PageAddr> 1-byte numerical string represents the number of the page to write
- <Data> n-byte alphanumerical string represents the data to write

Tag Type	Bytes	Description
Hitag 1	4	48 pages of 4 byte each
Hitag 2	4	8 pages of 4 byte each
EM 4x05	4	32 pages of 4 byte each
EM 4x02	-	Not supported
ISO FDXB	-	Not supported

If the command has been received correctly, the controller answers as following:

- "w" <Data> CR LF in case of successfully effected writing
or
- "N" CR LF in case of error.
Writing failed due to bad transmission conditions or false dimensions of <Data> relating to the characteristics of the tag.

Example

w0412345678 CR LF writes the data 12345678 on page 04 of the tag

2.2.7 Set LED “d” <StatusLED>

This command allows the administration of the led. The user is able to set the state of the LED manually.

<StatusLED> 1-byte alphanumerical string represents the parameter of the activation of the LED

Command	Description
“dg”	Activates the green led and deactivates the red LED
“dr”	Activates the red led and deactivates the green LED
“dn”	Deactivates both LEDs

If the command has been received correctly, the controller answers as following:

- “DG” CR LF on the command “dg”
- “DR” CR LF on the command “dr”
- “DN” CR LF on the command “dn”

Example

dr Answer “DR CR LF” and activation of the red LED

2.2.8 ANTENNA power off “p”

This command switches off the antenna power. The controller enters the stand-by mode, the consumption of the controller is reduced to app. 40 mA. All the tags presented in the range of the antenna are shut off and reset.

If the pin 16 (Enable) is set to logic low (OV) the entire controller is in Stand-by. In this function mode the antenna is switched off and all serial commandos are ignored.

To exit this mode, one has to change the pin 16 (Enable) from logic low or set it to logic high (which means: Enable=Open or +5V => Enable controller).

After carrying out this operation the controller starts to work in function mode “Continuous read”.

If the command has been received correctly, the controller answers as following:

- “P” CR LF confirms the acceptance of the command

Power on is only performed sending a reset command (“x” or “z”)

Example

p Answer “P” CR LF and the controller passes into stand-by mode

3 Testing the Module with the Demo-Software

3.1 Installing the Demo-Software

Download the supporting file package: <https://download.idtronic.de/Embedded/Embedded%20LF%20SDK.zip>

Extract the ZIP archive and locate the file “setup.exe” in folder “06_Test_Demo Software”:

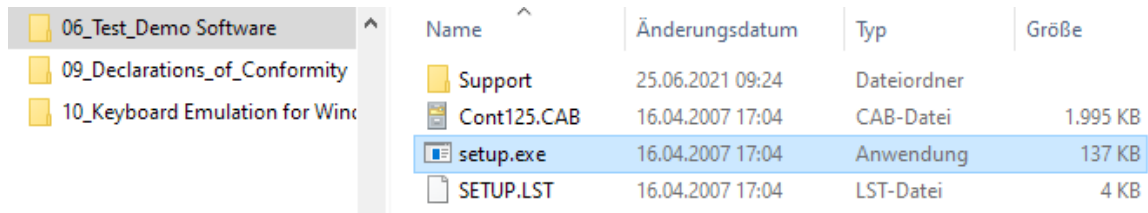


Figure 1 Locating the setup file for the test/demo software

Start “setup.exe” with double-click and confirm the following messages. If the information on replacing files pop-up, confirm with “keep existing”. After the installation is finished you can find the software using the search string “Cont125”.

3.2 Overview

The demo/test software has two windows:

- A main window labelled “Cont 125” with functions, input and output lines. The functions are active after leaving the continuous read mode with click on button [Exit Cont. Read]
- A terminal window labelled “Scanning” that shows the result of the continuous read mode. The device is always in continuous read mode after power-on.

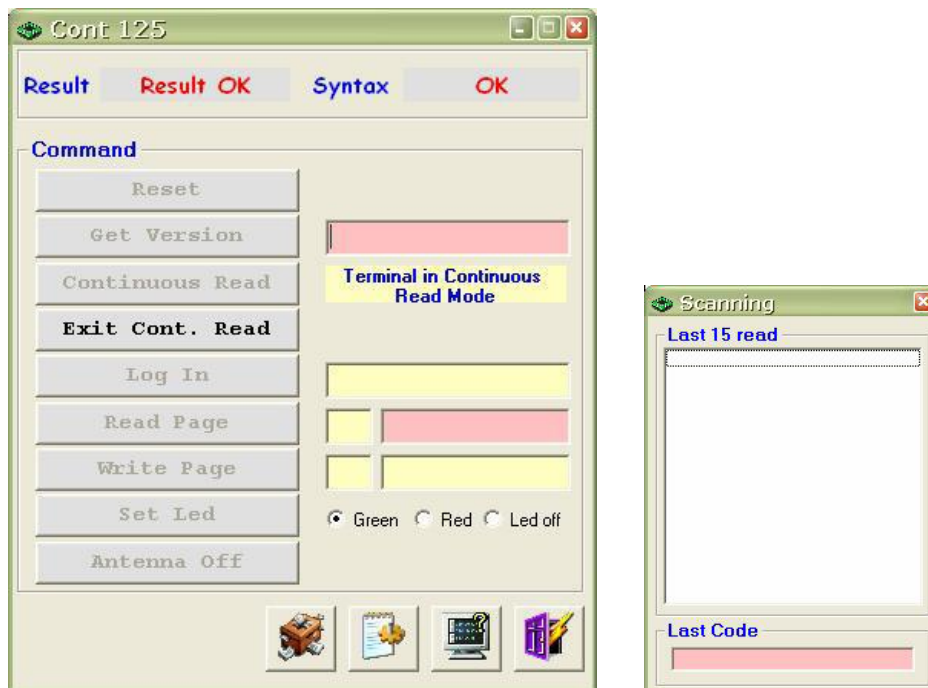


Figure 2 Main Program Window with additional Scanning Dialog

3.3 On First Start of the Demo Software

On first start this configuration dialog pops up.

- Click on [Serials Research]
- Select the suitable COM Port
- Click on [Save]



Figure 3 Configuration Dialog on first start

If you have not connected the LF-RFID hardware now, click on [Quit]

3.4 Reading a transponder

Starting the program, the controller is in. Continuous read. mode. Approximating the badge to the module. The scanning. window will show the last 15 read codes. To exit from the continuous read mode, you need to press [Exit Cont. Read]. After this you can use all the buttons of the program. (The reader does not accept any command if it is in continuous read mode)

3.5 Description of the command buttons

Reset

This command executes a reset of the controller. Pressing this button, a reset of the controller and of possible transponders in the reading-zone is caused. After successful reset, following message will appear in the Scanning. window:

- .MULTITag-125 a.01. and the module enters the continuous reading mode.

Get Version

This command requests the currently implemented firmware from the controller.

Following message will appear:

- .MULTITAG-125 a.01.

Continuous Read

Following this command, the controller reads and shows continuously the serial number of the transponder that remains in the reading zone. The reader supports different types of tags even if only one type of tag at a time can be read.

In the continuous reading mode, the controller effects a fast scanning of all the designated tags and forwards the serial number of the identified tag via serial-line.

Exit Cont. Read

This button allows you to exit the continuous reading mode.

Log In

This command is necessary for the authentication for tags of type EM 4x50 and HITAG 2. For the transponder EM 4x50 the command signification of the Login is the same as described on the datasheet of this transponder: it is necessary to forward the Login-command followed by the Password to have access to the protected memory area. For example, it is necessary to forward this command to execute the scripture of the password onto the transponder of the type EM4X50. Keep in mind that, as described in the respective datasheet, the Password on EM4X50 is the Long Word n°00 and that it cannot be read but only written if it (the current) is known. For the transponder HITAG2 it is necessary to know the password before any access in reading or writing is possible.

In both cases the login is affected automatically with the default values based on the ultimate identified type of tag.

Read page

This command allows the reading of a block of data of a tag (single reading). The dimension of the data returned by an answer depends on the type of tag used. Enter the number of page you would like to read (in hex), approximate the badge and click [Read Page]. The valid values of the number of the requested page depend also on the type of tag in use. The reading command of page 00 in case of tags of type EM 4x02 and ISO FDXB returns the serial number of the tag.

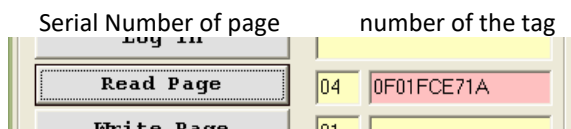


Figure 4 Output example of command read page

Write page

This command allows the writing of a block of data of a tag. After typing in the data, they will be automatically reread to verify the correct writing. Not all types of tags support the writing. The controller uses the type of tag, that has recently been read in the continuous reading mode. Enter the number of page and the code you would like to write and consequently press [Write page].

Set LED

This command allows the administration of the LEDs. The user is able to set the state of the led manually by activating the desired state and consequently pressing [Set Led].

Antenna off

This command switches off the antenna power. The controller enters the stand-by mode, the consumption of the controller is reduced. All the tags presented in the antenna range are shut off and reset. By pressing [Reset] or [Continuous Read], the module works again in the Continuous reading mode.

3.6 Description of the Menu Buttons





PINs	Name	Description
	SCANNING	Open and close the Scanning window
	COMMUNICATION MONITOR	This button opens a new window which shows the transactions carried out by the module and the communication with the PC.
	EXIT	Allows to exit the program.
	SETUP	Opens the dialog to configure the Demo-Software.



Figure 5 Configuration Dialog

- Choose the Com Port of your cable connection.
- “Serials Research” updates the list of all the ports, available on the respective PC.
- “Quit” allows to exit the program.
- “Save” saves the changes carried out in this window.
- Translate code outputs the Bytes bit-reversed, this works only for read-only tag types, e.g. EM4100

3.6.1 Example for Translate Code

UID in hex values: 803092D1C2

UID in bit values: 1000.0000.0011.0000.1001.0010.1101.0001.1100.0010

Translated

UID in hex values: 010C498B43 (translated)

UID in bit values: 0000.0001.0000.1100.0100.1001.1000.1011.0100.0011

4 Keyboard Emulation

4.1 Important Note

this software is totally free, but no longer supported.

If it still works, you are lucky.

If it no longer works with newer versions of windows, we cannot help you.

4.2 Installation

Download the supporting file package: <https://download.idtronic.de/Embedded/Embedded%20LF%20SDK.zip>

Extract the ZIP archive and locate the file “setup.exe” in folder “10_Keyboard Emulation for Windows”:

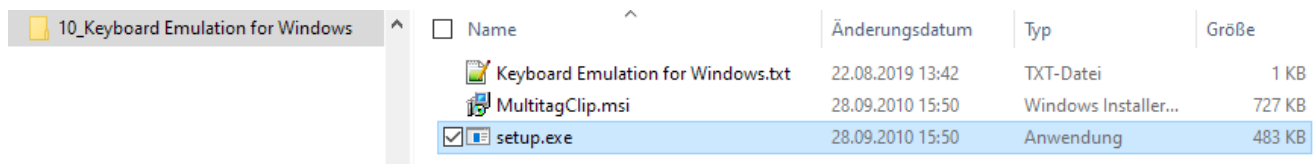


Figure 6 Locating the setup file for the software keyboard emulation

4.3 Operation

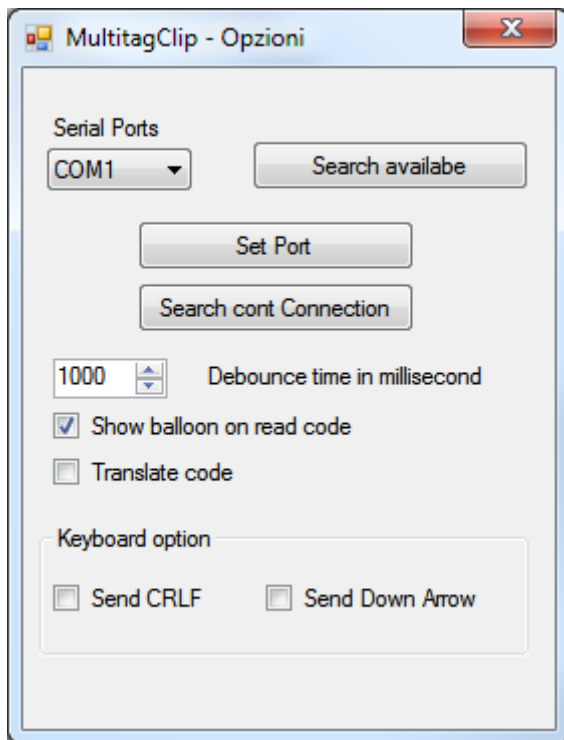


Figure 7 Configuration Dialog of Software Keyboard Emulation

1. Select the serial com port installed with the RFID reader. If no serial port is shown chose [Search available].

2. Select desired actions when auto-reading a tag, e.g.:

- “Show balloon on read code”. During standard operation this may disturb, but for a first operation check this is a helpful option. The balloon with the tag’s UID is shown above the systray.
- Select “Keyboard options” to simulate confirming the entered code and jump to the next position for further entries.

3. Confirm the selected serial port with “Set Port”.

Now the keyboard emulation is operating.

[Search cont Connection] will produce an error message without a tag on the reader.

5 Tag Information

5.1 EM4100 (64 bits), EM4102 (64 bits), EM4200 (128 bits)

This are read-only chip types, so you can only retrieve a UID.

5.2 EM4450/4550 (1 kbits)

Memory blocks (pages) of 32 bits/4 Bytes.

Block #	Hex Address	Access	Description
1	00	Read-only	Password, default 00000000h
2	01	Read-only	Protection Word
3	02	Read-only	Control Word
4	03	Read/write	User Memory
...	User Memory
31	1F	Read/write	User Memory
32	20	Read-only	Device Serial Number (UID)
33	21	Read-only	Device Identification

5.3 Hitag S 2048 (2 kbits, 256 Bytes)

Memory blocks (pages) of 32 bits/4 Bytes.

Block #	Hex Address	Access	Description
1	00	Read-only	UID
2	01	Read/write	Configuration Word, Hitag S 2048: CA0000AA, Hitag S 256: C90000AA
3	02	Read/write	Default value: 48544F4E
4	03	Read/write	Default value: 4D494B52
5	04	Read/write	User Memory
6	05	Read/write	User Memory
7	06	Read/write	User Memory
8	07	Read/write	User Memory, Limit for Hitag S 256 (HTSICH56)
9	08	Read/write	User Memory
...	User Memory
64	3F	Read/write	User Memory, Limit for Hitag S 2048 (HTSICH48)

5.4 Hitag 1 (2 kbits, 256 Bytes)

Memory blocks (pages) of 32 bits/4 Bytes.

Block #	Hex Address	Access	Description
1	00	Read-only	UID
2	01	Read/write	Configuration Word, Hitag 1: FF77AA00
3	02	No access	—
...	...	No access	—
16	0F	No access	—
17	10	Read/write	User Memory
...	User Memory
64	3F	Read/write	User Memory

5.5 Hitag 2 (256 bits, 32 Bytes)

Memory blocks (pages) of 32 bits/4 Bytes.

Block #	Hex Address	Access	Description
1	00	Read-only	UID
2	01	Read/write	Password RWD, default 4D494B52h
3	02	No access	—
4	03	Read/write	Configuration Word, password protected, default PW: 0000 0000 h
5	04	Read/write	User Memory / 64 bits read-only memory layout for read-only emulation
6	05	Read/write	User Memory / 64 bits read-only memory layout for read-only emulation
7	06	Read/write	User Memory
8	07	Read/write	User Memory

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