

USER MANUAL

HT EV800

HITAG™ Long Range Evaluation Kit

Product Description
Revision 2.0

November 1996



PHILIPS



- is the name of one of the universal and powerful product lines of our 125 kHz family. The HITAG product family is used both in the proximity area (operating range up to about 200 mm) and in the long range area (operating range up to about 1000 mm).

Developing our HITAG products, utmost consideration was given to security and reliability. The use of cryptography guarantees highest data security.

The central part of every HITAG read/write device is the HITAG Core Module, which ensures full compatibility for every HITAG read/write device.

Easy integration and application of the HITAG Core Module is due to its:

- small size
- standard interfaces
- full compatibility

To give you the possibility for an easy and quick start with our HITAG products we offer a HITAG Long Range Evaluation Kit.

Easy application certainly is an important factor in making the Long Range Evaluation Kit suitable for evaluation purposes. You will be able to present your ideas and demonstrate the performance of your system with the help of the HITAG Evaluation Kit.

hitagTM Long Range Evaluation Kit Description

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Definitions

| Data sheet status | |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| Objective specification | This data sheet contains target or goal specifications for product development. |
| Preliminary specification | This data sheet contains preliminary data; supplementary data may be published later. |
| Product specification | This data sheet contains final product specifications. |
| Limiting values | |
| Limiting values given are in accordance with the Absolute Maximum Rating System (IEC 134). Stress above one or more of the limiting values may cause permanent damage to the device. These are stress ratings only and operation of the device at these or at any other conditions above those given in the Characteristics section of the specification is not implied. Exposure to limiting values for extended periods may affect device reliability. | |
| Application information | |
| Where application information is given, it is advisory and does not form part of the specification. | |

Life support applications

These products are not designed for use in life support appliances, devices, or systems where malfunction of these products can reasonably be expected to result in personal injury. Philips Semiconductors customers using or selling these products for use in such applications do so on their own risk and agree to fully indemnify Philips Semiconductors for any damages resulting from such improper use or sale.

1. General Remarks

1.1. Scope of Delivery

The Evaluation Kit comprises the following components:

- 1 HITAG long range read/write device
- 1 Power supply unit
- 1 Interface cable
- 1 Power supply cable AC
- 1 Power supply cable DC
- Antenna
- 1 Floppy Disc (3 1/2") containing Evaluation Software
- Transponders
- User Manual
- Data sheet containing 1 floppy disc (3 1/2") with libraries and header files.

1.2. Specifications

- **Power supply via supply unit:** 110VAC/60Hz or 240VAC/50Hz (as per agreement), please take attention to the marking at the back of the supply unit!
- **Frequency:** 125 kHz
- **Temperature:** 0° - 70° C
- **Interface:** RS232

1.3. Hardware Startup

Metallic environment and electromagnetic interferences (e.g.: monitors, keyboards) have a negative effect on the range! At the HITAG Long Range Read/Write Device the signal processing unit is able to suppress up to two harmonic disturbers.

1.3.1. Connecting the Antenna

If an own built antenna instead of the standard flatcable antenna is used please refer to the document: Antenna Design for the HITAGTM Long Range System.

1.3.2. Connecting the Read/Write Device to the PC and Power Supply

After connecting the antenna, connect the supplied interface cable to the serial interface (COM1 or COM2) on your IBM compatible PC (286 or higher). Plug the power supply-cable into the power supply unit and please take attention to the marking at the back of the supply unit (110VAC or 240VAC).

1.4. Software Startup

1.4.1. System Requirements

In order to use the RFIDDEMO-Software the following system requirements must be satisfied:

- IBM-PC or compatible (minimum 286 processor)
- 640 kbyte RAM
- serial interface

1.4.2. Installation

1. Create a new directory on your PC for the Demo-Files (e.g.: C:\RFIDDEMO)
2. Copy all the files from the floppy disc into the directory you created in step 1.

1.4.3. Starting the Demo-Program

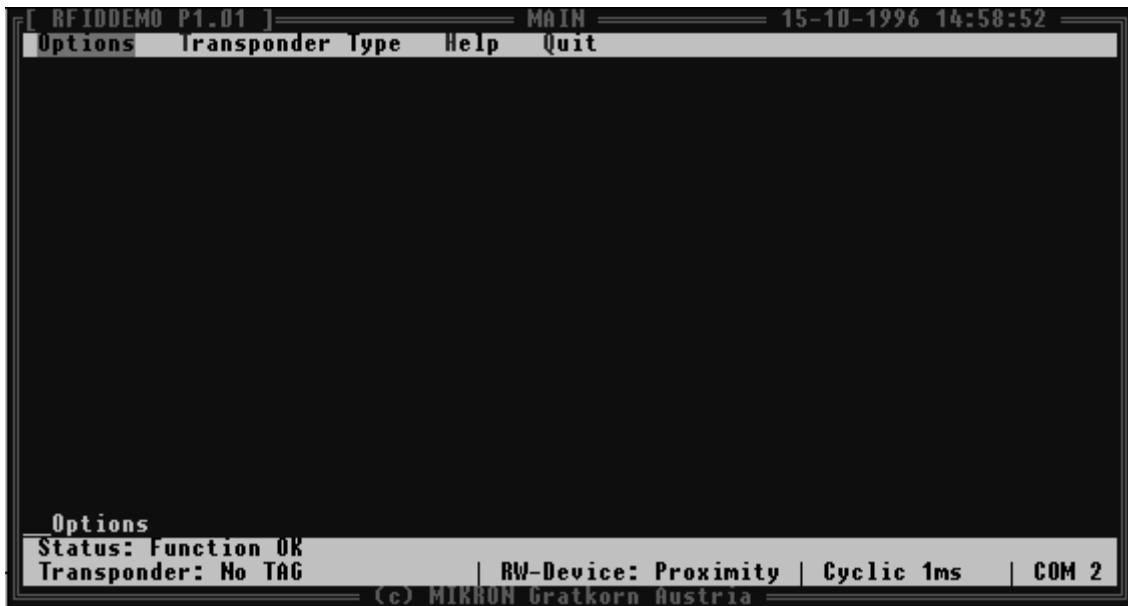
Start your Demo-Program by typing the command **RFIDDEMO.EXE**.

We strongly recommend to carefully read this description (especially chapters 8 and 9) before starting the Demo System! Inconsiderate use of individual menu options may result in unwanted irreversible changes in access rights.

2. General Definitions for the Demo-Software

- <ESC> quits a submenu.
- Scrolling the menubar is done with the cursor keys ↑ and ↓.
- <ALT F4> always quits the program.
- <ENTER> chooses the submenu shown with ➡.
- You can also use the hotkeys to select a submenu.
- All menu items coloured in blue are not enabled in the software.
- Upon starting the software checks which serial interface is used for communication with the read/write device. This may last for some seconds.
- <F1> for Help.

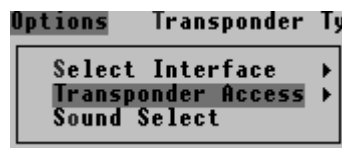
3. Mainmenu



The two bottom lines display error messages, information about transponder, interface and read/write device.

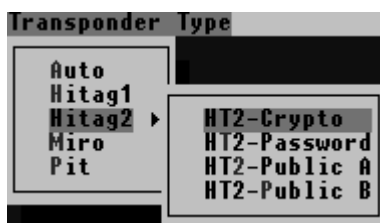
| | |
|---------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Status: | Displays error resp. status messages. |
| Transponder: | Shows the chosen transponder (e.g.: HT2 Crypto) |
| RW-Device: | Gives information about the type of connected read/write device (Proximity or Long Range) |
| Cyclic 1ms: | Shows the mode of command repetition (Single or Cyclic access with delay time between end of first and beginning of the next command). See chapter 3.1 (Options Transponder Access). |
| COM 2: | Shows the used serial interface (COM 1 or COM 2) |

3.1. Options



| | |
|----------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Select Interface: | Chooses the serial interface (COM 1 or COM 2). |
| Transponder Access: | Switches between single and periodically repeated commands. The specified value determines the time between the end of the first and the beginning of the next command. |
| Sound Select: | Enables a signal tone after successful read commands. |

3.2. Transponder Type



Auto: Initiates automatically transponder recognition (e.g.: HT2-Crypto) and pressing ENTER switches to the correct submenu.

Please note: HT2 Public A transponders will also be recognized as MIRO transponders. To access HT2 Public A transponders use the proper submenu *HT2-Public A*.

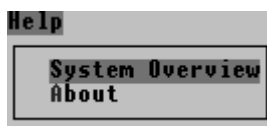
Hitag1: Provides access to HITAG 1 transponders.

Hitag2: Chooses between the four modes of this transponder, *Password*, *Crypto*, *Public A* and *Public B*.

Miro: Provides access to MIRO read only transponders.

Pit: Provides access to PCF793x transponders.

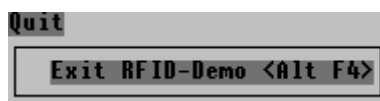
3.3. Help



System Overview: Gives a short overview on the 125kHz transponder system.

About: Gives short information about the software.

3.4. Quit



Use this command to exit the demoprogram.

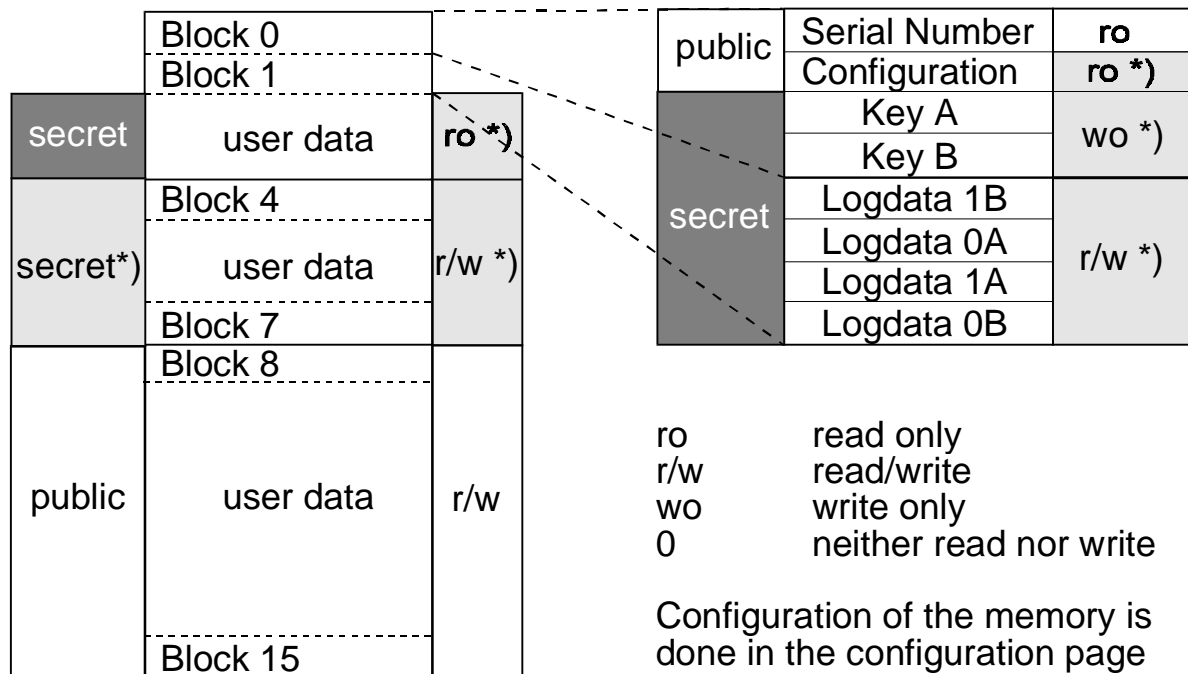
4. HITAG 1 Transponders

4.1. Memory Partitioning

The 2 KBit EEPROM memory on the transponder is divided into 16 blocks. Every block consists of 4 pages with 4 bytes (at 8 bits) each.

Addressing is done page by page and access is gained either page by page or block by block entering the respective start address. In case of block read (or write) the transponder is processed from the start to the end of the block.

The drawing below describes the memory configuration on the Demokit transponder:



*) Areas (or settings) marked with an asterisk *) may be configured by the client.

The memory location described above and marked with an asterisk *) has been configured by Philips Semiconductors, whereby the content of some of the memory areas is free, some allocated.

Block 0 defines the serial number, the configuration of the memory area and the keys, Block 1 the logdata.

Memory locations marked with "secret" can only be accessed after a mutual authentication. An enciphered data communication is used in that area.

Memory locations marked with "public" can be accessed without mutual authentication, no encryption is used.

Transponders delivered with this Demokit are configured as follows:

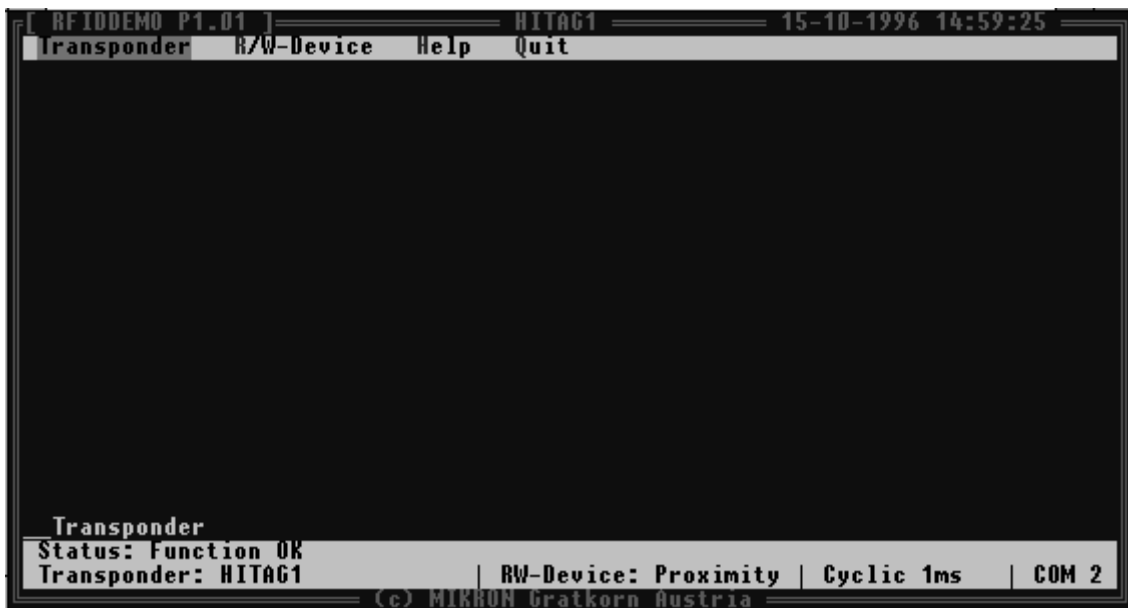
Blocks 4 to 7 of the transponder are public and read/write.

The table shows that the logdata can be both written and read, keys can only be written. That means that keys and logdata can be changed.

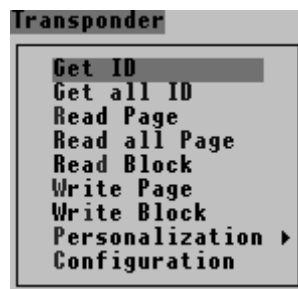
Important! You have to be very careful when changing keys and logdata as inconsiderate use results in loss of access to the secret area on the transponder. See Chapter 9 for a detailed description.

4.2. Operating HITAG 1 Transponders

Operating a HITAG 1 transponder the screen will be displayed as follows:



4.3. Transponder



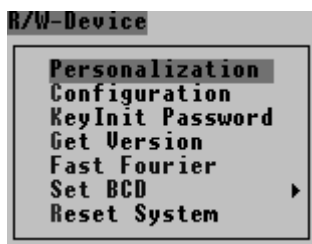
- Get ID:** Reads the ID number of the transponder located in the field of the antenna.
- Get all ID:**^{*)} Reads the ID numbers of up to 10 transponders located in the field of the antenna. If more transponders are in the field, the total number is displayed in the bottom line of the window.
- Read Page:** On entering a page number (0-63) one page (4 bytes) of the transponder is read and displayed on the screen.
- Read all Page:**^{*)} On entering a page number (0-63) the content of one page (4 bytes) of up to 10 transponders is read and displayed on the screen.
- Read Block:** On entering a block number (0-15) and a page number (0-3) one block (16 bytes) of the transponder (TAG) is read and displayed on the screen.
- Write Page:** On entering a page number (8-63) and 4 bytes of numbers one page (4 bytes) is written to the transponder (TAG).
- Write Block:** On entering a block number (2-15), a page number (0-3) and 16 bytes of numbers one block (16 bytes) is written to the transponder (TAG).

Attention: You can only write cyclically on a TAG that is in the field when you initiate the right command. To write to another TAG please repeat the write command.

- Personalization:** Gives access to key and passwords stored on the transponder (TAG)
(see also chapter 9)
- Configuration:** Submenu used to change the configuration of the transponder,
(see also chapter 8)

*) The commands **Get all ID** and **Read all Page** are only enabled when using HITAG Long Range Read/Write Devices.

4.4. R/W-Device



- Personalization:** Submenu to change keys and passwords of the read/write device.
(refer to chapter 9)
- Configuration:** Submenu used to change the configuration of the read/write device.
(refer to chapter 8)
- KeyInit Password:** Use this submenu to change the password for the configuration and personalization (see chapters 8 and 9).
- Get Version:** Reads the version and programming date of the firmware and the serial number of the Core Module.
- Fast Fourier:*)** This command starts the Fast Fourier Transformation (FFT) of the Digital Signal Processor. This command is to be used as often as required depending on the noise floor of the environment.
- Set BCD:*)** This command adjusts the timing of the read/write device to the antenna. The command has to be operated once, when an antenna is connected for the first time or changed.
- Reset System:** Resets the read/write device and switches off high frequency for 100 ms. As a consequence the transponder in the antenna field is reset (e.g.: transponder that is in Halt Mode will respond again).

*) The commands **Fast Fourier** and **Set BCD** are only enabled when using HITAG Long Range Read/Write Devices.

5. HITAG 2 Transponders

5.1. Memory Partitioning

The memory of the transponder (TAG) consists of 256 bits EEPROM and is organized in 8 pages with 32 bits each. The READ and WRITE instructions always read or write a whole page, and the address transmitted by the base station represents the page address.

Depending on the mode of operation the EEPROM is organized in the following way:

crypto mode:

| Page | Content |
|------|---------------------------------------------|
| 0 | ID number |
| 1 | 32 bit Key: "KEY LOW" |
| 2 | 16 bit Key " KEY HIGH" |
| 3 | 8 bit Configuration, 24 Bit Password TAG |
| 4 | read/write Page |
| 5 | read/write Page |
| 6 | read/write Page |
| 7 | read/write Page |

password mode:

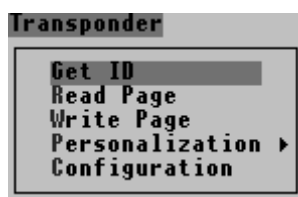
| Page | Content |
|------|---------------------------------------------|
| 0 | ID number |
| 1 | Password RWD |
| 2 | reserved |
| 3 | 8 bit Configuration, 24 bit Password TAG |
| 4 | read/write Page |
| 5 | read/write Page |
| 6 | read/write Page |
| 7 | read/write Page |

5.2. Crypto Mode

Operating a HITAG 2 transponder in crypto mode the screen will be displayed as follows:



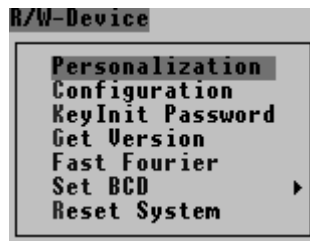
5.2.1. Transponder



- | | |
|-------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Get ID: | Reads the ID number of the transponder located in the field of the antenna. |
| Read Page: | On entering a page number (0-7) one page of the transponder is read and displayed on the screen. |
| Write Page: | On entering a page number (4-7) and 4 bytes of numbers one page is written to the transponder. |
| Personalization: | <p>Gives access to the key and password stored on the transponder (TAG).</p> <ul style="list-style-type: none"> • Key is used to encrypt the data sent to and received from the transponder. • Password TAG is sent from transponder to read/write device and can be verified by the latter depending on the configuration of the read/write device (see also chapter 9) |
| Configuration: | Submenu used to change the configuration of the transponder. (see also chapter 8) |

Attention: You can only write cyclically on a TAG that is in the field when you initiate the right command. To write on another TAG please repeat the write command.

5.2.2. R/W-Device



- Personalization:** Submenu to change keys and passwords of the read/write device. (see also chapter 9)
- Configuration:** Submenu used to change the configuration of the read/write device. (see also chapter 8)
- KeyInit Password:** Use this submenu to change the password for the configuration and personalization (see chapter 8 and 9).
- Get Version:** Reads the version and programming date of the firmware and the serial number of the Core Module.
- Fast Fourier:**^{*)} This command starts the Fast Fourier Transformation (FFT) of the Digital Signal Processor. This command is to be used as often as required depending on the noisefloor of the environment.
- Set BCD:**^{*)} This command adjusts the timing of the read/write device to the antenna. The command has to be operated once, when an antenna is connected for the first time or changed.
- Reset System:** Resets the read/write device and switches off high frequency for 100 ms. As a consequence the transponder in the antenna field is reset (e.g.: transponder that is in Halt Mode will respond again).

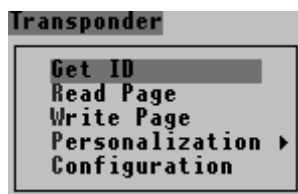
^{*)} The commands **Fast Fourier** and **Set BCD** are only enabled when using HITAG Long Range Read/Write Devices.

5.3. Password Mode

Operating a HITAG 2 transponder in password mode the screen will be displayed as follows:



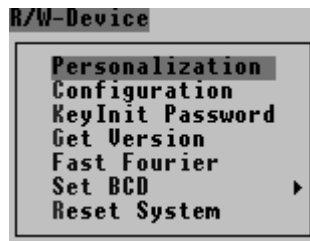
5.3.1. Transponder



- | | |
|-------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Get ID: | Reads the ID number of the transponder located in the field of the antenna. |
| Read Page: | On entering a page number (0-7) one page of the transponder is read and displayed on the screen. |
| Write Page: | On entering a page number (4-7) and 4 bytes of numbers one page is written to the transponder. |
| Personalization: | <p>Gives access to the two passwords stored in the transponder (TAG). (see also chapter 9)</p> <ul style="list-style-type: none"> • Password RWD is sent from read/write device to transponder and checked for identity by the latter • Password TAG is sent from transponder to read/write device and can be verified by the latter depending on the configuration of the read/write device. |
| Configuration: | Submenu used to change the configuration of the transponder. (see also chapter 8) |

Attention: You can only write cyclically on a TAG that is in the field when you initiate the right command. To write to another TAG please repeat the write command.

5.3.2. R/W-Device

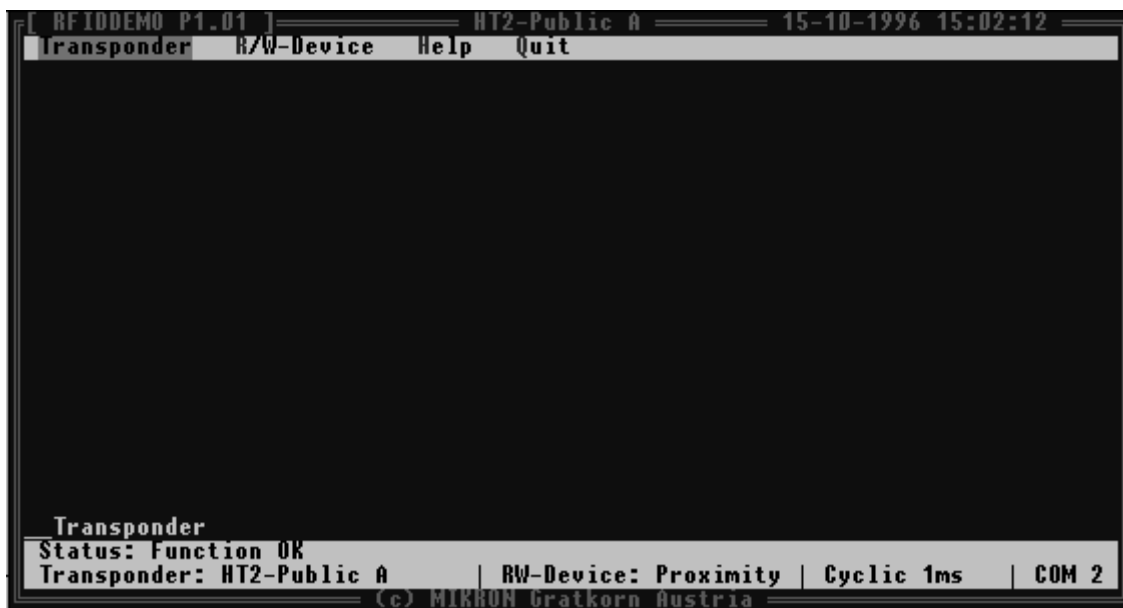


- Personalization:** Submenu to change keys and passwords of the read/write device. (see also chapter 9)
- Configuration:** Submenu used to change the configuration of the read/write device. (see also chapter 8)
- KeyInit Password:** Use this option to change the password for the configuration and personalization (see chapter 8 and 9).
- Get Version:** Reads the version and programming date of the firmware and the serial number of the Core Module.
- Fast Fourier:**^{*)} This command starts the Fast Fourier Transformation (FFT) of the Digital Signal Processor. This command is to be used as often as required depending on the noisefloor of the environment.
- Set BCD:**^{*)} This command adjusts the timing of the read/write device to the antenna. The command has to be operated once, when an antenna is connected for the first time or changed.
- Reset System:** Resets the read/write device and switches off high frequency for 100 ms. As a consequence the transponder in the antenna field is reset (e.g.: transponder that is in Halt Mode will respond again).

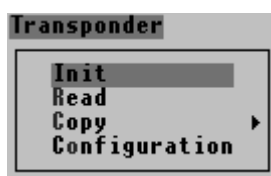
^{*)} The commands **Fast Fourier** and **Set BCD** are only enabled when using HITAG Long Range read/write devices.

5.4. Public Mode A

Operating a HITAG 2 transponder in Public Mode A the screen will be displayed as follows:



5.4.1. Transponder

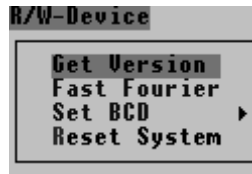


- Init:** Opens a submenu to configure the HT2 transponder as HT2-Public A and allows you to write 5 bytes of data to the transponder.
- Read:** Reads the data of a HT2-Public A transponder.
- Copy:** Opens a submenu to read the contents of a MIRO transponder, write these data to a HT2 transponder and set it into Public Mode A.
- Configuration:** Submenu used to change the configuration of the transponder.

Please note: If you set a HITAG 2 transponder to Public Mode A an **Init** procedure has to be carried out before reading the HT2-Public A transponder.

Otherwise you might get a **NOTAG** message.

5.4.2. R/W-Device

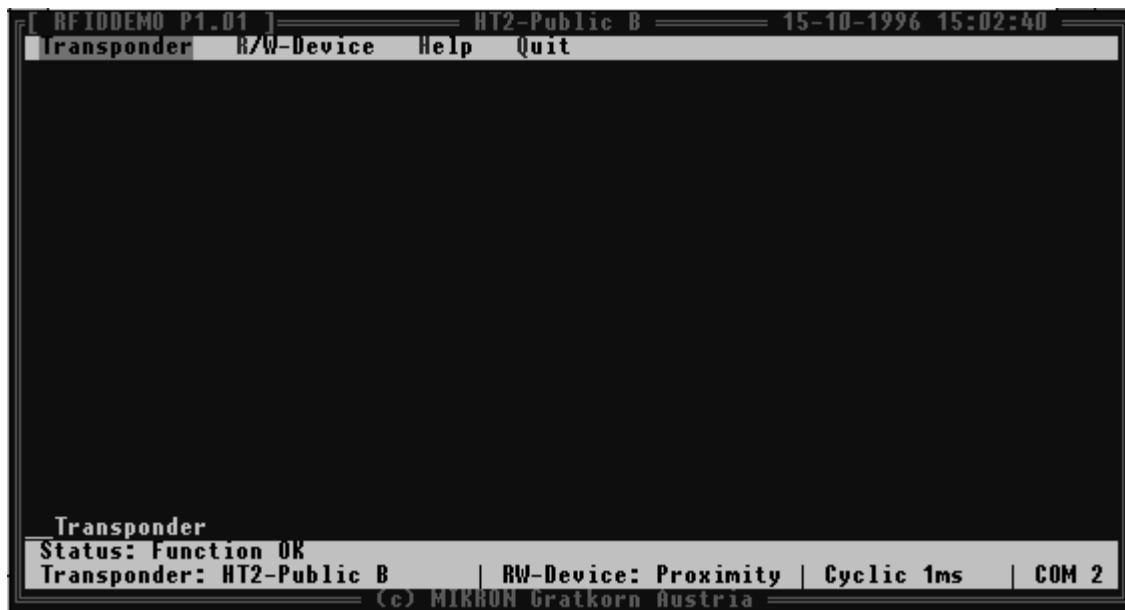


- Get Version:** Reads the version and programming date of the firmware and the serial number of the Core Module.
- Fast Fourier:**^{*)} This command starts the Fast Fourier Transformation (FFT) of the Digital Signal Processor. This command is to be used as often as required depending on the noisefloor of the environment.
- Set BCD:**^{*)} This command adjusts the timing of the read/write device to the antenna. The command has to be operated once, when an antenna is connected for the first time or changed.
- Reset System:** Resets the read/write device and switches off high frequency for 100 ms.

^{*)} The commands **Fast Fourier** and **Set BCD** are only enabled when using HITAG Long Range read/write devices.

5.5. Public Mode B

Operating a HITAG 2 transponder in Public Mode B the screen will be displayed as follows:

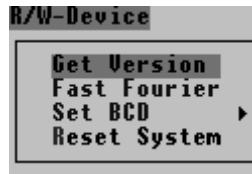


5.5.1. Transponder



Read: Reads the data of a HT2-Public B transponder.

5.5.2. R/W-Device



- Get Version:** Reads the version and programming date of the firmware and the serial number of the Core Module.
- Fast Fourier:**^{*)} This command starts the Fast Fourier Transformation (FFT) of the Digital Signal Processor. This command is to be used as often as required depending on the noisefloor of the environment.
- Set BCD:**^{*)} This command adjusts the timing of the read/write device to the antenna. The command has to be operated once, when an antenna is connected for the first time or changed.
- Reset System:** Resets the read/write device and switches off high frequency for 100 ms.

^{*)} The commands **Fast Fourier** and **Set BCD** are only enabled when using HITAG Long Range read/write devices.

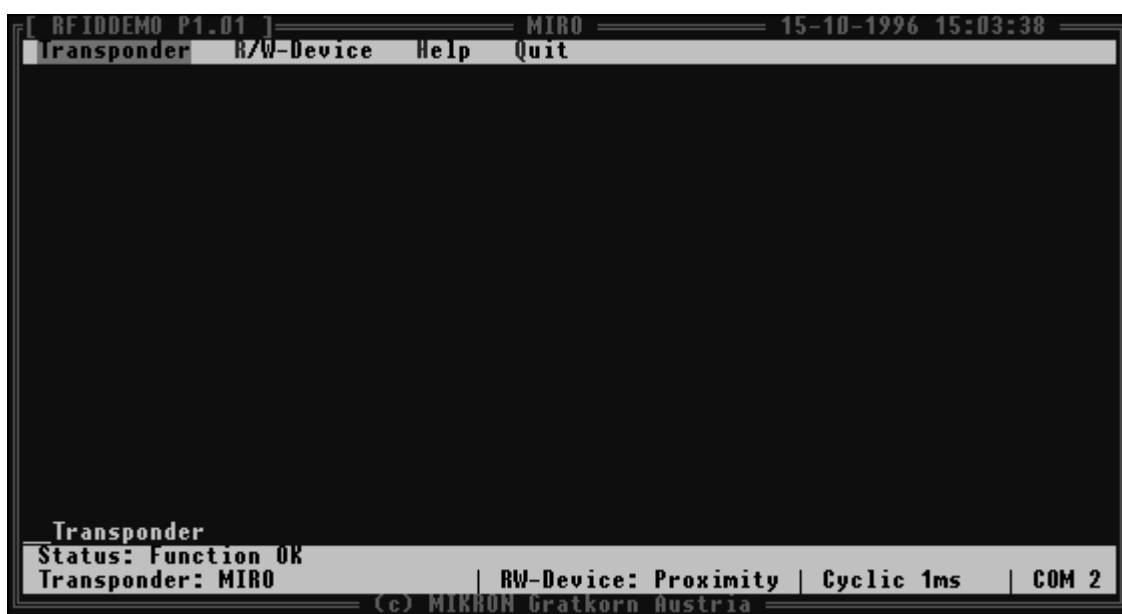
6. MIRO Transponders (μEM H400x)

6.1. Memory size

In the 64 bit memory the unique 40 bit serial number of the transponder is stored as well as 24 bits header and parity bits. The data are read only and cannot be changed.

6.2. Operating MIRO Transponders

Operating a MIRO transponder the screen will be displayed as follows:



6.3. Transponder



Read Miro: Reads the serial number of a MIRO read only transponder.

6.4. R/W-Device



- Get Version:** Reads the version and programming date of the firmware and the serial number of the Core Module.
- Fast Fourier:**^{*)} This command starts the Fast Fourier Transformation (FFT) of the Digital Signal Processor. This command is to be used as often as required depending on the noisefloor of the environment.
- Set BCD:**^{*)} This command adjusts the timing of the read/write device to the antenna. The command has to be operated once, when an antenna is connected for the first time or changed.
- Reset System:** Resets the read/write device and switches off high frequency for 100 ms.

^{*)} The commands **Fast Fourier** and **Set BCD** are only enabled when using HITAG Long Range read/write devices.

7. Error Messages

Error messages and the message *function OK* are displayed in the status line.

- | | |
|----------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| • function OK | System is working correctly. |
| • serial error | Error on the serial interface. |
| • NOTAG | There is no transponder in the communication field of the antenna or a not initialized HT2 Public A or B is in the communication field of the antenna or a HT2 Crypto was accessed using the wrong key. |
| • TIMEOUT error | There is not enough energy to write to the transponder. |
| • AUTHENT error | An error occurred during the authentication process. |
| • QUIT error | The acknowledgement was not received correctly. |
| • CRYPTO not initialized | A cryptographic command was transmitted without authentication. |
| • HT2 authentication error | No conformity between password RWD stored in the read/write device and password RWD stored on the transponder, or a HT2-Crypto Tag was accessed using the Password mode. |
| • incorrect password TAG | No conformity between password TAG stored in the read/write device and password TAG stored on the transponder. |
| • EEPROM error | Read/write device EEPROM check sum error. |
| • EEPROM wrong old data | On comparison old and new data (for keys and passwords) prove inconsistent. |
| • EEPROM write protected | Parts of the EEPROM on the read/write device were locked using the configuration menu and a write access to this part was tried. |
| • EEPROM read protected | Parts of the EEPROM on the read/write device were locked using the configuration menu and a read access to this part was tried. |

8. Configuration of HITAGTM Transponders

8.1. Security Mechanism

All the data necessary for the authentication of the transponder and the read/write device as well as data needed for encryption can be protected from being read and from being written on the read/write device using special commands.

This mechanism has 3 levels:

Level 0: All security relevant data can be read and written.

Level 1: The data cannot be read any more. If you want to change an entry, you have to know the old value. Otherwise writing access will be denied.

Level 2: The internal data are locked and can neither be read nor written. At this level it is impossible for the user to change the stored data.

The following data are subject to the mechanism described above:

- | | | |
|---------------------------|---|--------------------------|
| • Key information A and B | } | for HITAG 1 transponders |
| • Logdata 0A, 0B | | |
| • Logdata 1A, 1B | | |
| • Key information | } | for HITAG 2 transponders |
| • Password TAG | | |
| • Password RWD | | |

You cannot reset levels, e.g. from level 2 to level 1. Once a security level has been chosen it becomes irreversible.

If you want to write the key and passwords to or read them from the read/write device you have to enter the KeyInit Password.

If you do not know this password, you will not be able to enter the personalization and configuration submenus of the read/write device as you cannot read this password from the read/write device.

To change the KeyInit Password you have to know the current value.

After entering the correct KeyInit Password access to the personalization and configuration submenus of the read/write device is granted.

8.2. HITAG 1 Transponders

Using HITAG 1 transponders you are able to configure the following items:

8.2.1. Read/Write Device

| HT1 RWD Configuration | | |
|-----------------------------------------------------------------|----------------|-------------------------|
| | Current Config | New Config |
| Key A | ReadWrite | ReadWrite |
| Key B | ReadWrite | ReadWrite |
| Logdata 0A (A TAG) | ReadWrite | ReadWrite |
| Logdata 1A (A RWD) | ReadWrite | ReadWrite |
| Logdata 0B (B TAG) | ReadWrite | ReadWrite |
| Logdata 1B (B RWD) | ReadWrite | ReadWrite |
| KeyInit Password | WriteOnly | WriteOnly |
| CAUTION: Once LOCKED, only a higher security level is possible! | | |
| SELECT: CrUp, CrDn | | CHANGE: CrLeft, CrRight |
| <ESC> to quit, <CTRL><Enter> to accept | | |

| | | |
|----------------------------|---|------------------------------------------------------------------------------------------------------------------------------------------|
| Key A: | } | Lets you choose among the 3 security levels, as described before. ReadWrite, WriteOnly and NoAccess (see chapter 8.1, resp. 9.1.1) |
| Key B: | | |
| Logdata 0A (A TAG): | | |
| Logdata 1A (A RWD): | | |
| Logdata 0B (B TAG): | | |
| Logdata 1B (B RWD): | } | |
| KeyInit Password: | | |

8.2.2. Transponder

| HT1 Tag Configuration | | |
|-----------------------|----------------|------------|
| | Current Config | New Config |
| Block 2 | ReadWrite | ReadWrite |
| Block 3 | ReadWrite | ReadWrite |
| Block 4 | ReadWrite | ReadWrite |
| Block 5 | ReadWrite | ReadWrite |
| Block 6 | ReadWrite | ReadWrite |
| Block 7 | ReadWrite | ReadWrite |
| Keys A,B | WriteOnly | WriteOnly |
| Logdata | ReadWrite | ReadWrite |
| Block 4-7 | Public | Public |
| Configuration | ReadWrite | ReadWrite |

SELECT: CrUp, CrDn CHANGE: CrLeft, CrRight
 <ESC> to quit, <CTRL><Enter> to accept

| | |
|-----------------------|---------------------------------------------|
| Block 2: | Can be set to ReadWrite or ReadOnly. |
| Block 3: | Can be set to ReadWrite or ReadOnly. |
| Block 4: | Can be set to ReadWrite or ReadOnly. |
| Block 5: | Can be set to ReadWrite or ReadOnly. |
| Block 6: | Can be set to ReadWrite or ReadOnly. |
| Block 7: | Can be set to ReadWrite or ReadOnly. |
| Keys A,B: | Can be set to WriteOnly or Locked. |
| Logdata: | Can be set to ReadWrite or Locked. |
| Block 4-7 | Can be set to Public or Secret access. |
| Configuration: | Locks the configuration of the transponder. |

If you set the state of *Configuration* to *Locked* you cannot reset this setting back to *ReadWrite*.

8.3. HITAG 2 Transponders

Using HITAG 2 transponders you are able to configure the following items:

8.3.1. Read/Write Device

| HT2 RWD Configuration | | |
|-----------------------------------------------------------------|----------------|------------|
| | Current Config | New Config |
| Key | ReadWrite | ReadWrite |
| Password TAG | ReadWrite | ReadWrite |
| Password RWD | ReadWrite | ReadWrite |
| Check Password TAG | Off | Off |
| KeyInit Password | WriteOnly | WriteOnly |
| Lock Configuration | Unlocked | Unlocked |
| CAUTION: Once LOCKED, only a higher security level is possible! | | |
| SELECT: CrUp, CrDn CHANGE: CrLeft, CrRight | | |
| <ESC> to quit, <CTRL><Enter> to accept | | |

| | | |
|----------------------------|---|-------------------------------------------------------------------|
| Key: | } | Lets you choose among the 3 security levels, as described before. |
| Password TAG: | | |
| Password RWD: | | |
| |) | (see chapter 8.1 resp. 9.1.2) |
| Check Password TAG: | | Enables checking of the <i>Password TAG</i> . |
| KeyInit Password: | | Can be set to WriteOnly or Locked. |
| Configuration: | | Locks the configuration of the read/write device. |

If you set the state of *CheckPasswordTag* to *ON* or *Configuration* to *LOCKED* you cannot reset these settings.

8.3.2. Transponder

| HT2 Tag Configuration | | |
|-----------------------------------------------------------------|----------------|------------|
| | Current Config | New Config |
| Page 1-2 | ReadWrite | ReadWrite |
| Page 3 | ReadWrite | ReadWrite |
| Page 4-5 | ReadWrite | ReadWrite |
| Page 6-7 | ReadWrite | ReadWrite |
| Version | Crypto | Crypto |
| CAUTION: Once LOCKED, it is unchangeable! | | |
| SELECT: CrUp, CrDn CHANGE: CrLeft, CrRight | | |
| <ESC> to quit, <CTRL><Enter> to accept | | |

- Page 1-2:** Can be set to ReadWrite or NoAccess/Locked.
Page 3: Can be set to ReadWrite or ReadOnly/Locked.
Page 4-5: Can be set to ReadWrite or ReadOnly.
Page 6-7: Can be set to ReadWrite or ReadOnly.
Version: Changes between Password, Crypto, Public A and Public B mode.

**If you set the state of Pages 1-2 to *NoAccess/LOCKED* or the state of Page 3 to *ReadOnly/LOCKED* you cannot reset these settings back to *ReadWrite*.
Page 3 locks the complete configuration of the transponder. Once set to *ReadOnly/LOCKED* you cannot reset this setting back to *ReadWrite*.**

9. Personalizing your Read/Write Device and the Transponders

Note: It is NOT NECESSARY to personalize the read/write device and the transponders in order to operate the Evaluation Kit!

A pre - personalization was done by Philips Semiconductors.

In order to profit from the full functionality of the HITAG system, the Evaluation Kit, however, supports all cryptographic features.

This requires the use of some secret data (keys, logdata and passwords). The process of **loading these data** into the **read/write device** is called **personalization**. The same personalization procedure has to be carried out on your transponders. The read/write device and the transponders are personalized by Philips Semiconductors by means of defined **Transport Keys, Transport Logdata** and **Transport Passwords** (HITAG 1 Keys and Logdata are set to 0x00000000, HITAG 2 Key is set to 0x4D494B524F4E, HITAG 2 Password TAG to 0xAA4854 and HITAG 2 Password RWD to 0x4D494B52).

Therefore you can operate the Evaluation Kit without changing any data. If you want to use own keys, logdata or passwords you have to personalize read/write device and transponders as it is described in the following chapters.

Make sure you are in a safe environment while writing secret data to the transponder or the read/write device. This prevents possible listening in to the communication between HOST and read/write device.

On the next few pages you find a description of how to personalize your read/write device. In Chapter 9.3. the loading of own keys, logdata and passwords into the read/write device and the transponder is described in exact order.

9.1. General Definitions

In order to be able to read data from the secret area of a transponder, you have to carry out a procedure called authentication. To do this you need special data (keys).

After transmitting the according command the authentication is automatically carried out by the HITAG Read/Write Device.

9.1.1. HITAG 1 Transponders

9.1.1.1. Definition of the Keys

Keys are cryptographic codes, which determine data encryption during data transfer between read/write device and transponder.

Two keys (Key A and Key B) which you can use independently of each other, have been installed for security and flexibility reasons. The identity of either Key A or Key B on the read/write device and on the transponder is sufficient (see table under 9.1.1.2.).

The keys are predefined by Philips Semiconductors by means of defined Transport Keys (both keys show the same bit map). They can be written to, which means that they can be changed.

9.1.1.2. Definition of the Logdata

Logdata represent "passwords" needed to gain access to secret areas on the transponder. A pair of logdata is included with every cryptographic key (Key A and Key B). This logdata pair has to be identical both on the transponder and the read/write device.

| | | |
|-----------|--------------------------------|------------------------------------------------------------------------------------------------------------------|
| ad Key A: | Logdata 0 A | "Password" which the transponder sends to the read/write device and which is verified by the latter. |
| | Logdata 1 A | "Password" which the read/write device sends to the transponder and which is checked for identity by the latter. |
| ad Key B: | Logdata 0 B and Logdata 1 B | analogous to Key A |

The logdata are also predefined by Philips Semiconductors using defined Transport Logdata (all logdata show the same bit map). They can be read and written. Logdata 0A and 1A, as well as Logdata 0B and 1B do not have to show the same values, but all Logdata have to be identical on the read/write device and on the transponder!

So it is important that the following values are in accordance with each other, i.e. the respective data on the read/write device and on the transponder have to be identical pairs:

| on the read/write de- vice | | on the transponder | |
|----------------------------------|---|-----------------------|---------|
| KEY A | ↔ | KEY A | } Set A |
| LOGDATA 0A | ↔ | LOGDATA 0A | |
| LOGDATA 1A | ↔ | LOGDATA 1A | |
| | | | |
| KEY B | ↔ | KEY B | } Set B |
| LOGDATA 0B | ↔ | LOGDATA 0B | |
| LOGDATA 1B | ↔ | LOGDATA 1B | |

Attention: Keys and Logdata only can be changed if the Transport Keys and the Transport Logdata are known!

9.1.2. HITAG 2 Transponders

9.1.2.1. Definition of the Keys

Keys are cryptographic codes, which determine data encryption during data transfer between read/write device and transponder.

The key is predefined by Philips Semiconductors by means of a defined transport key.

9.1.2.2. Definition of the Passwords

Passwords are needed to gain access to the transponder. A pair of passwords is stored in every transponder. This password pair has to be identical both on the transponder and the read/write device.

Password TAG: Password that the transponder sends to the read/write device and which may be verified by the latter (depending of the configuration of the read/write device).

Password RWD: Password that the read/write device sends to the transponder and which is checked for identity by the latter.

The passwords are also predefined by Philips Semiconductors using defined transport passwords. They can be read and written. *Password TAG* and *Password RWD* do not have to show the same values, but all passwords have to be identical on the read/write device and on the transponder!

The passwords are predefined by Philips Semiconductors by means of defined transport passwords.

So it is important that the following values are in accordance with each other, i.e. the respective data on the read/write device and on the transponder have to be identical pairs:

| on the read/write device | | on the transponder |
|--------------------------|---|--------------------|
| KEY | ↔ | KEY |
| Password TAG | ↔ | Password TAG |
| Password RWD | ↔ | Password RWD |

9.2. Personalization Concept

To enable utmost security and flexibility Philips Semiconductors worked out a personalization concept that shall be shortly described in the following:

The first stage is a test that is done by the producer respectively Philips Semiconductors. Here the unique serial number is fixed and transport keys and transport passwords are pre-programmed.

In the next stage the customers program their own keys and passwords (so nobody besides them can access the transponders) and configure the memory of the transponders. We recommend to lock sensitive areas, that means for example to prevent the possibility to change keys and passwords for the user.

In the last stage the user just reads from and writes to the memory of the transponders.

9.3. Changing Keys and Passwords

You can change keys and passwords using the menu options in the **personalization** submenu for the read/write device and for the transponders. You have to be careful when carrying out such a change.

Entering the personalization submenu for the read/write device requires a password you have to enter only once when running the demosoftware. The default password is set to **00000000** by Philips Semiconductors.

You do not have to change this data in order to operate the Demonstration Kit!

If you want to change keys and passwords, please, strictly follow the steps below:

- **Set Transponder Access to Single access! (See chapter 3.1)**
- **Place transponders one after the other directly on the antenna or hold them directly to it! (0-distance)**

9.3.1. HITAG 1 Transponders

9.3.1.1. Changing Keys

Please, note the order of the steps!

1. Access the transponder (using the Transport Keys).
2. Change a key (e.g.: Key A) on the transponder, i.e., using transponder personalization submenu, see chapter 4.3.
3. Change Key A on the read/write device to the new value (using the Personalization submenu, see Chapter 4.4).

Caution: On the transponder the key can only be written, which means that you cannot call up the entry! Moreover, you need to know the old value if you want to change the key on the read/write device! (If you enter wrong values the message *Wrong old data* is displayed.)

Only after carrying out correctly steps 1 through to 3 may the second key be changed following the steps described above. Conveniently you change both keys to the same value!

9.3.1.2. Incorrect Procedures Changing Keys

- You change both keys on the read/write device and then try to access the transponder. This is not possible (the status line displays the message *Authentication error*) because there is no identity between any of the keys on the transponder and the read/write device.
- You change only one key (e.g.: Key A) on the read/write device; the second key (in this example B) remains the Transport Key. Then you try again to access the transponder. In this case you will gain access because one key (here it is Key B) on the transponder and the read/write device is still identical. Therefore, the status line briefly displays the message *Authentication error* (after the first failed attempt to gain access using the changed key) then the message *Function OK* appears.

The same scenario applies if you first change one or both of the keys on the transponder but leave the keys on the read/write device unchanged (transport keys).

9.3.1.3. Changing Logdata

Change logdata using the same procedure as described for changing keys. Be careful to change them by pairs (on the read/write device and on the transponder):

1. Change, for example, Logdata 0A on the transponder (by overwriting Page 5).
2. Change Logdata 0A on the read/write device to the new value.
3. Change Logdata 1A on the transponder (by overwriting Page 6).
4. Change Logdata 1A on the read/write device to the new value.

Again, you need to know the old values before they can be changed on the read/write device. Therefore, we recommend that you use a table to record changed keys and logdata during the first phase of getting to know the system!

When you change a key, this does not mean that you also have to change the corresponding logdata and the other way round.

9.3.2. HITAG 2 Transponders

9.3.2.1. Changing the Key

Please, note the order of the steps!

1. Access the transponder in crypto mode (using the Transport Key).
2. Change the key on the transponder, using the transponder personalization submenu (see chapter 5.2.1). You do not need to change the password.
3. Change the key on the read/write device to the new value (using the RW-Device personalization submenu, see chapter 5.2.2).

Only after carrying out correctly steps 1 through to 3 the transponders are accessible with the new key.

9.3.2.2. Incorrect Procedures Changing the Key

- You change the key on the read/write device and then try to access the transponder. This is not possible (the status line displays the message *NOTAG*) because there is no identity between the keys on the transponder and the read/write device.

The same scenario applies if you first change the key on the transponder but leave the key on the read/write device unchanged (transport key).

9.3.2.3. Changing Passwords

Change passwords using the same procedure as described for changing the key. Be careful to change them by pairs (on the read/write device and on the transponder).

1. Access the transponders in password mode.
2. Change one Password (e.g.: *Password TAG*) on the transponders using the transponder personalization submenu (see chapter 5.3.1).
3. Change *Password TAG* on the read/write device to the new value (using the RW-Device personalization submenu, see chapter 5.3.2).

Only after carrying out correctly steps 1 through to 3 (executing a read-access test the message **Function OK** has to be displayed in the status line) may the second password be changed following the same steps described above.

When you change e.g. *Password TAG*, this does not mean that you also have to change *Password RWD* and the other way round.

9.3.2.4. Incorrect Procedures Changing Passwords

- You change the *Password RWD* on the read/write device and then try to access the transponder. This is not possible (the status line displays the message *incorrect Password RWD*) because there is no identity between the *Password RWD* on the transponder and on the read/write device.
- You change the *Password TAG* on the read/write device and then try to access the transponder. This is not possible (the status line displays the message *incorrect Password TAG*) because there is no identity between the *Password TAG* on the transponder and on the read/write device. This only applies, if you enabled checking of the *Password TAG* (see chapter 8.3.1) in the read/write device.

The same scenario applies if you change the passwords on the transponders but leave the passwords on the read/write device unchanged (transport passwords).

10. Ordering Information

HITAG Long Range Evaluation Kit:

| Type Name | Description | Ordering Number |
|-----------|---------------------------------|-----------------|
| HT EV800 | HITAG Long Range Evaluation Kit | 9352 341 50122 |

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