UM1084
User manual

CR95HF development software

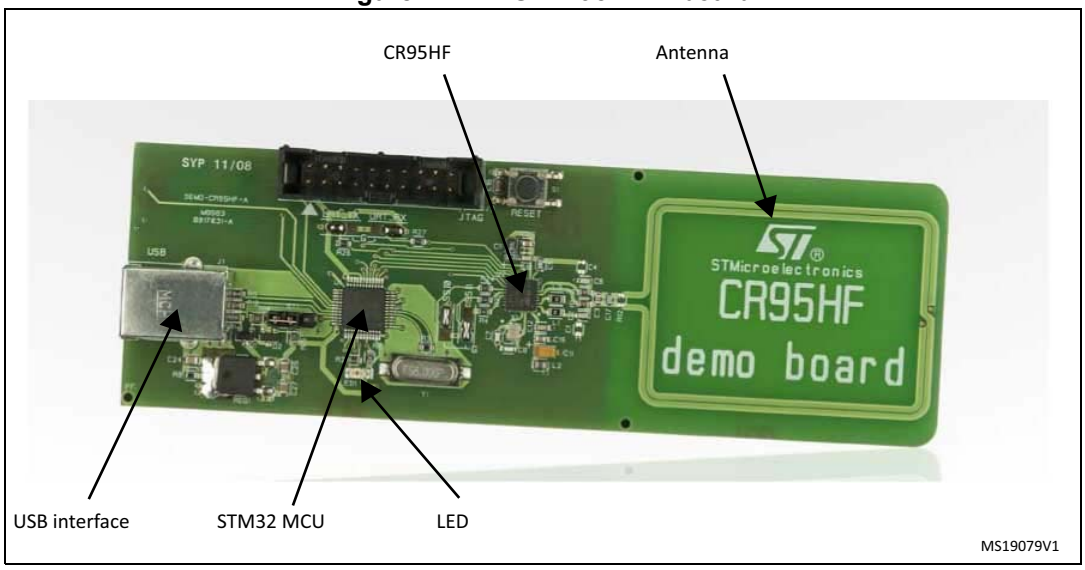
Introduction

The CR95HF development software (STSW-95HF001) is a PC software which allows to configure, evaluate, and communicate with ST CR95HF 13.56 MHz multi-protocol contactless transceiver.

The software must be used in conjunction with the DEMO-CR95HF-A demonstration kit (see *Figure 1*) which includes a ready-to-use board to interface with the host PC through a USB interface. This reader is also included in the M24LR-DISCOVERY.

The DEMO-CR95HF-A is powered through the USB bus and no external power supply is required. It includes a CR95HF contactless transceiver, a 48 x 34 mm 13.56 MHz inductive etched antenna and the associated tuning components. The CR95HF communicates with the STM32F103CB 32-bit core MCU via the SPI bus.

Figure 1. DEMO-CR95HF-A board



Reference documents

- DEMO-CR95HF-A databrief
- CR95HF datasheet

Contents

1 **Installing the CR95HF development software (STSW-95HF001) 6**

2 **Using the CR95HF development software 11**

2.1 Launching the CR95HF development software 11

2.2 Main menu 13

2.3 User commands 13

2.3.1 CR95HF commands menu 14

2.3.2 RX95HF commands menu 21

2.4 ISO15693 menu 28

2.5 ISO14443-A menu 31

2.5.1 ISO14443-A Cards commands 32

2.5.2 TOPAZ user interface 33

2.5.3 M24SR user interface 34

2.5.4 NFC Type 4A - NDEF Message user interface 45

2.6 ISO14443-B menu 50

2.6.1 ISO14443-B Cards commands 51

2.6.2 ISO14443-B NFC commands 53

2.6.3 Type_4B NDEF Message user interface 54

2.6.4 SRIxx/SRTxx products 55

2.7 ISO18092 menu 56

2.8 Tools menu 58

2.8.1 DEMO-CR95HF-A toolbox 59

2.8.2 Tag Detection tool 60

2.8.3 Auto detection tool 61

2.8.4 Script tool 62

2.9 Help menu 63

2.10 Log window 66

3 **Revision history 67**

List of tables

Table 1. Document revision history 67

List of figures

Figure 1. DEMO-CR95HF-A board . . . 1
Figure 1. setup.exe welcome message . . . 6
Figure 2. setup.exe licence agreement . . . 7
Figure 3. Select the destination folder . . . 7
Figure 4. Insert the CR95HF development software from the start menu . . . 8
Figure 5. Create desktop or quick launch icons (optional) . . . 8
Figure 6. Install the CR95HF development software on your computer . . . 9
Figure 7. Install the CR95HFdll.dll . . . 9
Figure 8. Read the CR95HF development software README . . . 10
Figure 9. Launch the CR95HF development software . . . 10
Figure 10. DEMO-CR95HF-A detection message 1/3 . . . 11
Figure 11. DEMO-CR95HF-A detection message 2/3 . . . 12
Figure 12. DEMO-CR95HF-A detection message 3/3 . . . 12
Figure 13. Main menu . . . 13
Figure 14. User command menu . . . 14
Figure 15. CR95HF user interface menu . . . 15
Figure 16. IDN window . . . 15
Figure 17. Protocol Select window . . . 16
Figure 18. Field OFF window . . . 16
Figure 19. ISO15693 window . . . 17
Figure 20. ISO14443-A window . . . 17
Figure 21. ISO14443-B window . . . 17
Figure 22. ISO18092 window . . . 18
Figure 23. ISO15693 Inventory (260100) transmitted using a SendRecv request . . . 18
Figure 24. Idle window . . . 19
Figure 25. RdReg window . . . 19
Figure 26. WrReg window . . . 20
Figure 27. Set UART baud rate window . . . 20
Figure 28. Echo window . . . 21
Figure 29. RX95HF commands menu . . . 21
Figure 30. IDN window . . . 22
Figure 31. Protocol Select window . . . 23
Figure 32. ISO14443-A windows . . . 23
Figure 33. Poll Field windows . . . 24
Figure 34. Listen window . . . 24
Figure 35. Send window . . . 25
Figure 36. Idle window . . . 25
Figure 37. Read Register window . . . 26
Figure 38. Write Register window . . . 26
Figure 39. AC-Filter window . . . 27
Figure 40. Echo window . . . 27
Figure 41. ISO15693 menu . . . 28
Figure 42. Example of ISO15693 user interface for M24LR64 . . . 30
Figure 43. Selecting User Mode from ISO15693 user interface (M24LR64) . . . 31
Figure 44. ISO14443-A menu . . . 32
Figure 45. ISO14443-A selected from the list . . . 32
Figure 46. TOPAZ user interface . . . 34
Figure 47. M24SR user interface . . . 35

Figure 48. CR95HF protocol selection sequence . . . 35
Figure 49. Anticollision process results . . . 36
Figure 50. RF OFF on autocollision RATS PPS button . . . 37
Figure 51. RF OFF on autocollision RATS PPS results . . . 37
Figure 52. NFC Type 4A button available . . . 38
Figure 53. ISO14443-A button available . . . 38
Figure 54. RF request and RF answer . . . 38
Figure 55. “Show Log” button . . . 38
Figure 56. Log windows of RF request/answer . . . 38
Figure 57. NFC Type 4A user interface . . . 39
Figure 58. I_Block, R_Block, S_Block requests . . . 39
Figure 59. I_Block, R_Block, S_Block answer . . . 39
Figure 60. Capacity container file selected . . . 40
Figure 61. Specific CC file array . . . 41
Figure 62. System file selected . . . 41
Figure 63. Specific system file array . . . 42
Figure 64. NDF file is selected . . . 42
Figure 65. Binary data and NDEF message are detected . . . 43
Figure 66. Password management button . . . 44
Figure 67. Password management buttons . . . 44
Figure 68. NDEF message management button . . . 44
Figure 69. NFC Type 4A - NDEF message user interface . . . 45
Figure 70. Log window of configuration setup . . . 45
Figure 71. NDEF message is displayed . . . 46
Figure 72. Log window when occur error on READ NDEF MESSAGE process . . . 46
Figure 73. Write Text NDEF message . . . 47
Figure 74. Write URL NDEF message . . . 47
Figure 75. Write SmartPoster NDEF message . . . 48
Figure 76. Write BT pairing NDEF message . . . 48
Figure 77. Write vCard NDEF message . . . 49
Figure 78. Write proprietary data . . . 49
Figure 79. Log file when occur error on WRITE NDEF MESSAGE process . . . 50
Figure 80. ISO14443-B menu . . . 50
Figure 81. Example of ISO14443-B user interface . . . 52
Figure 82. Log file . . . 52
Figure 83. ISO1443-B user interface . . . 53
Figure 84. Protocol select for ISO14443-B . . . 53
Figure 85. ISO14443-B NFC user interface . . . 54
Figure 86. NFC Type 4B user interface . . . 55
Figure 87. Example of ISO14443-B user interface for SRIxxx . . . 55
Figure 88. ISO18092 menu . . . 56
Figure 89. ISO18092 log window . . . 57
Figure 90. Tools menu . . . 58
Figure 91. DEMO-CR95HF-A toolbox . . . 59
Figure 92. Tag detection interface . . . 61
Figure 93. Auto Detect tool interface . . . 62
Figure 94. Script tool interface . . . 63
Figure 95. Help menu . . . 64
Figure 96. Change background color menu . . . 64
Figure 97. Script help . . . 65
Figure 98. About window . . . 65
Figure 99. Log window for an Idle command . . . 66

1 Installing the CR95HF development software (STSW-95HF001)

To install the CR95HF development software (STSW-95HF001):

1. Download the latest revision of the CR95HF development software from http://www.st.com.
2. Unzip the setup.zip file.
3. Execute the setup.exe file to install the CR95HF development software on your computer. Follow the instructions described in *Figure 1* to *Figure 9* to install the CR95HF development software under C:\Program files, and CR95HFDll.dll system file under C:\WINDOWS\system32.

When the installation process is complete, you can launch the CR95HF development software. Refer to *Section 2* for a detailed description of the software functions.

Figure 1. setup.exe welcome message

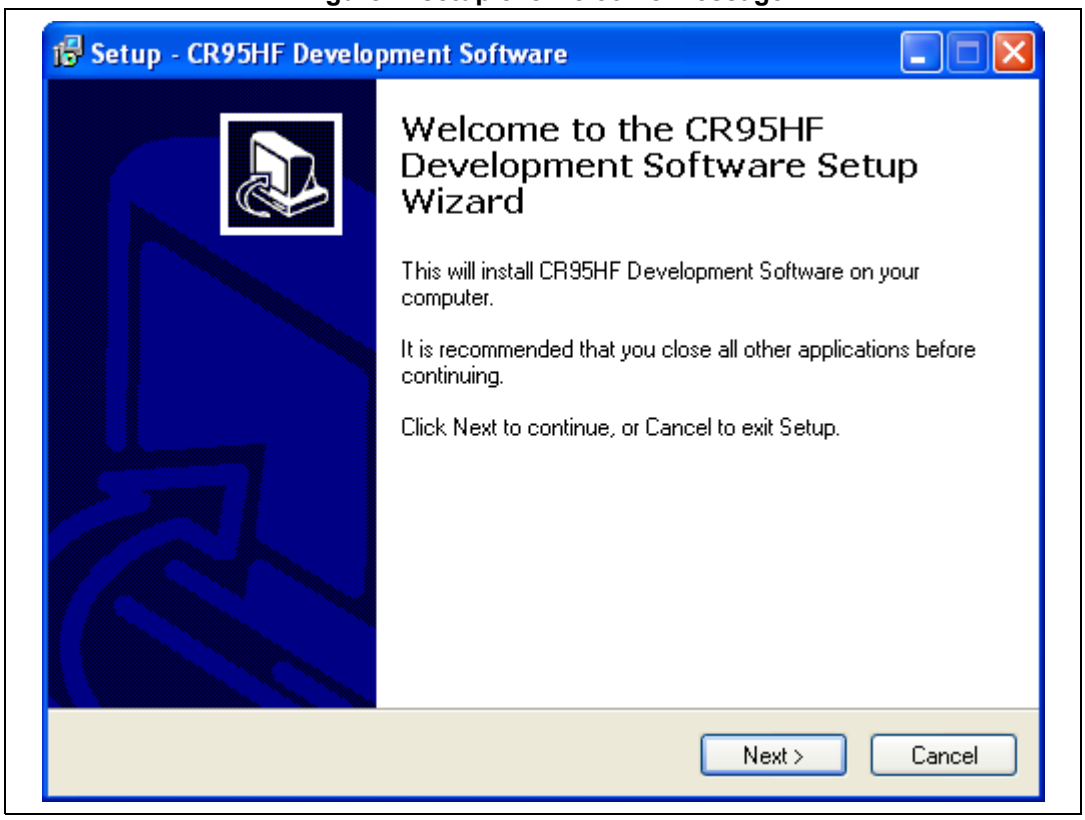


Figure 2. setup.exe licence agreement

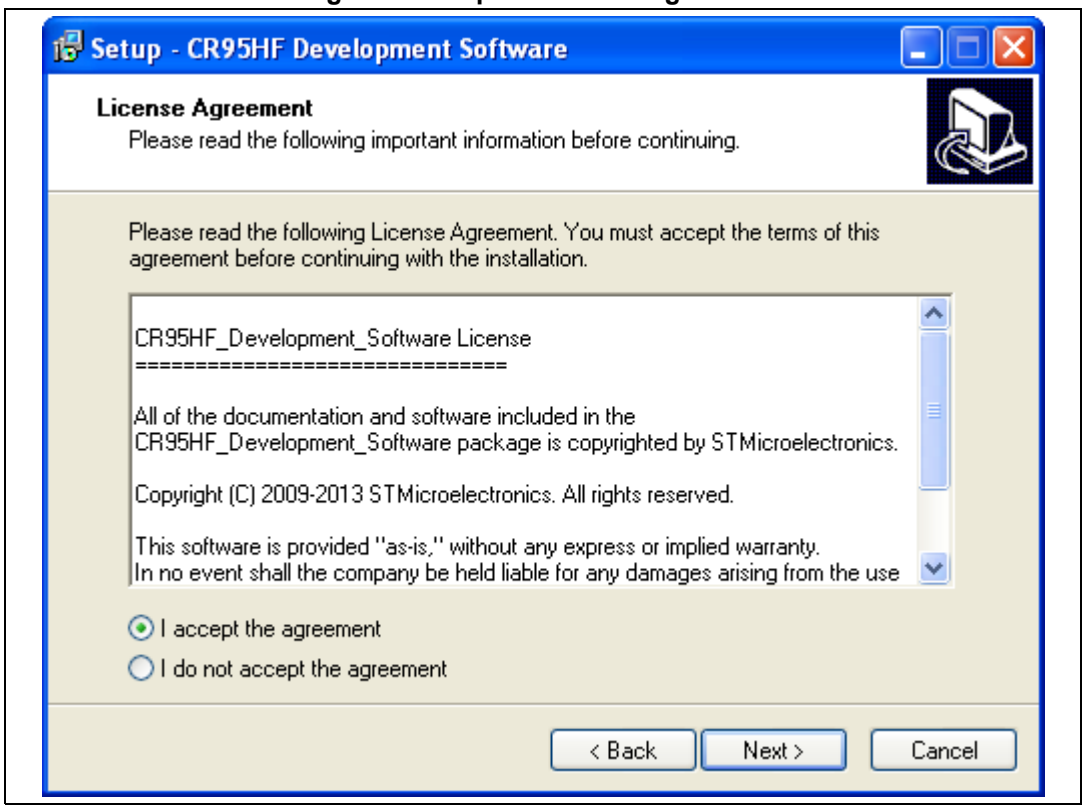


Figure 3. Select the destination folder

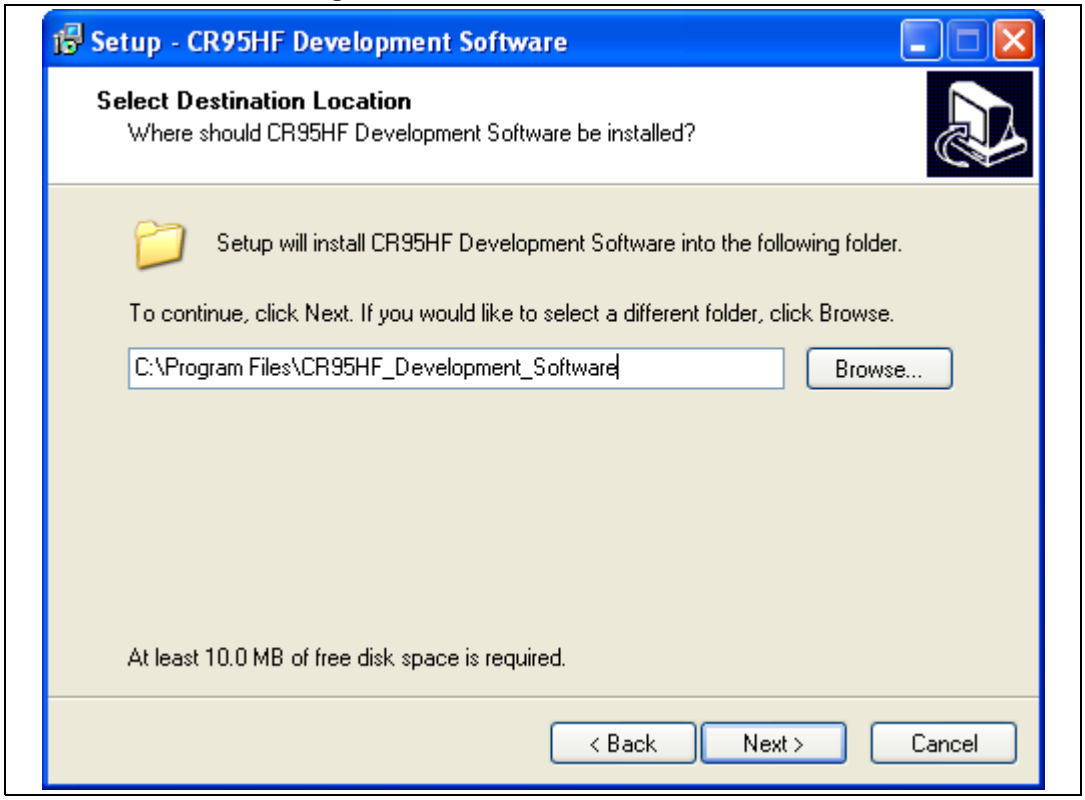


Figure 4. Insert the CR95HF development software from the start menu

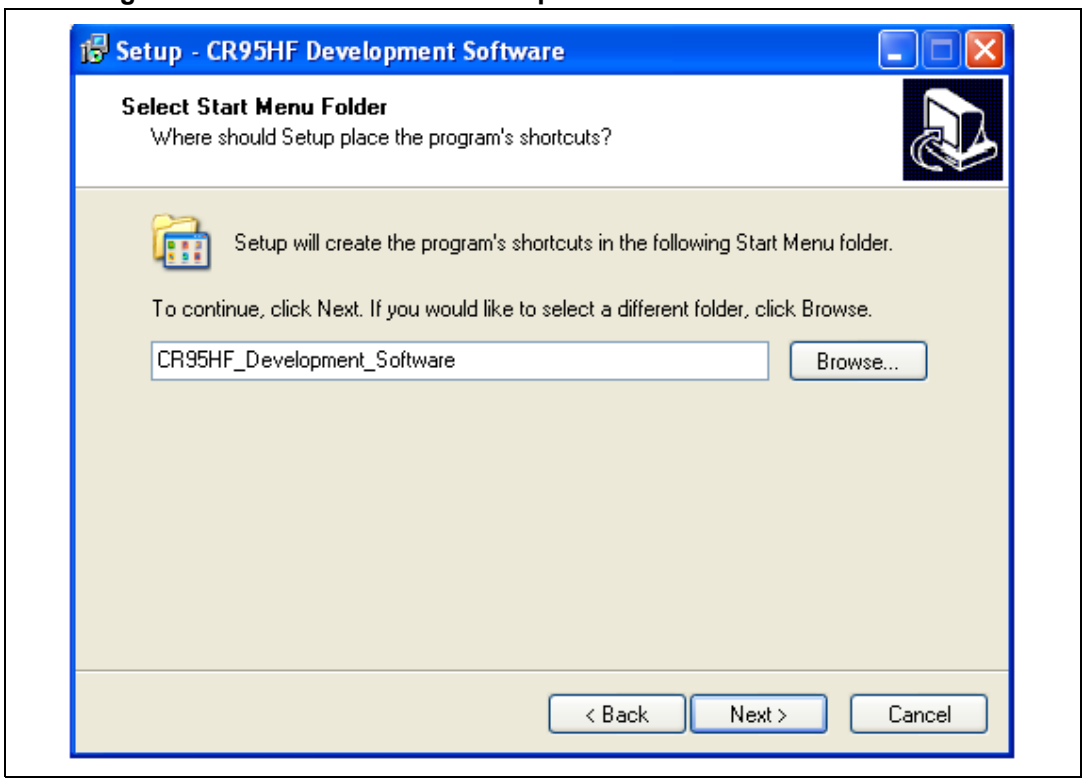


Figure 5. Create desktop or quick launch icons (optional)

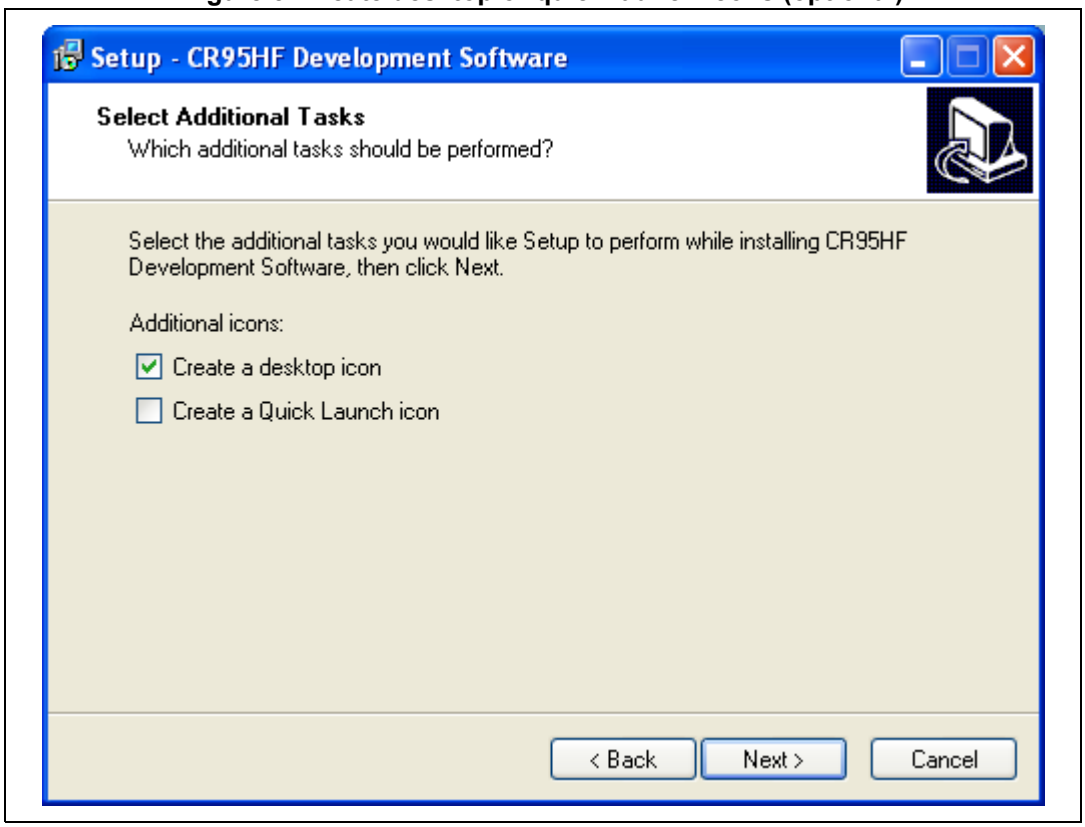


Figure 6. Install the CR95HF development software on your computer

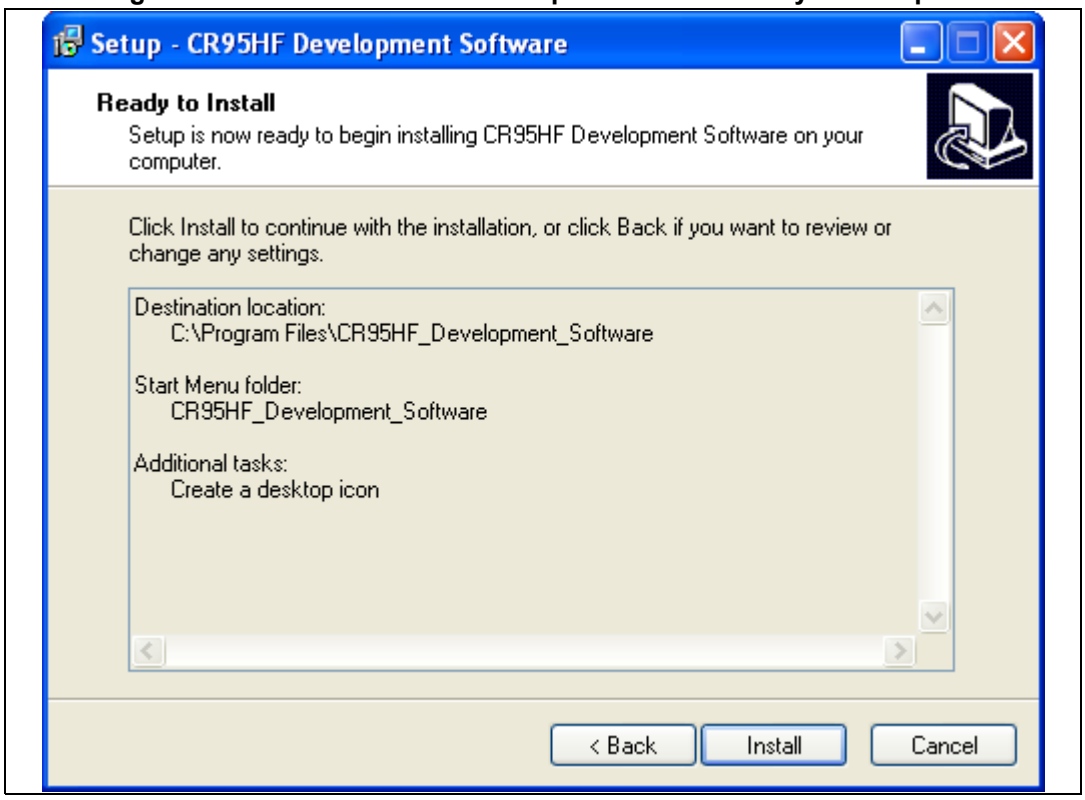


Figure 7. Install the CR95HFdll.dll

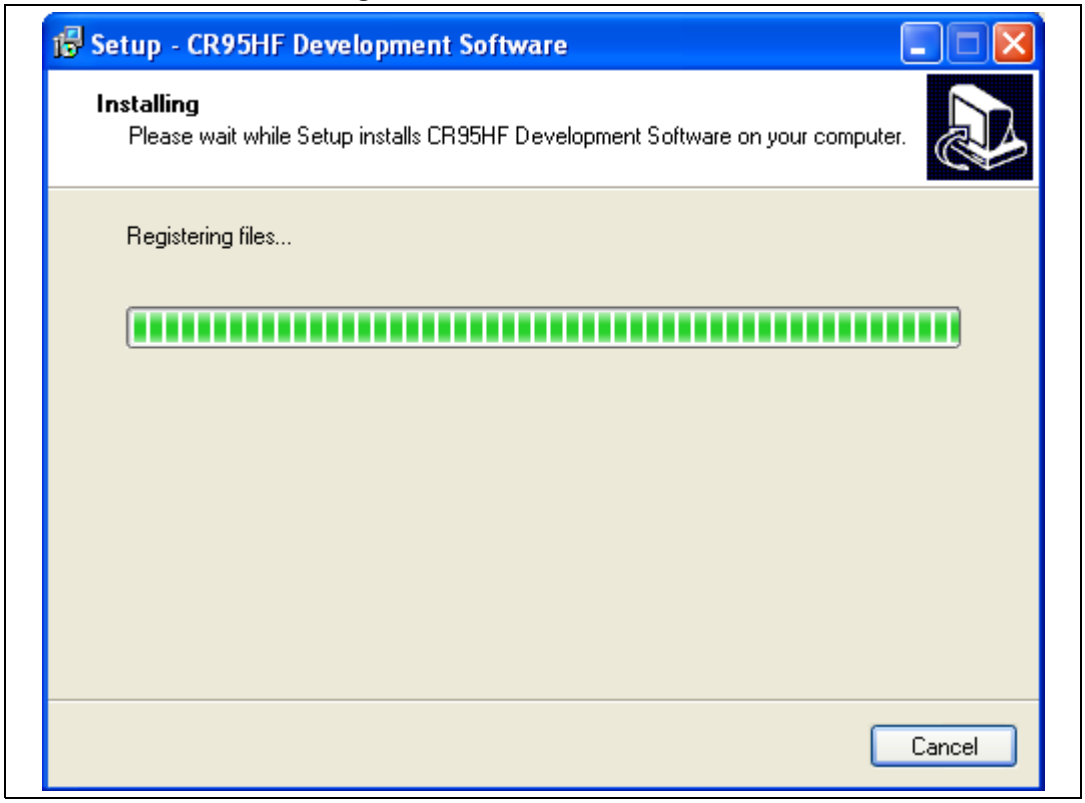


Figure 8. Read the CR95HF development software README

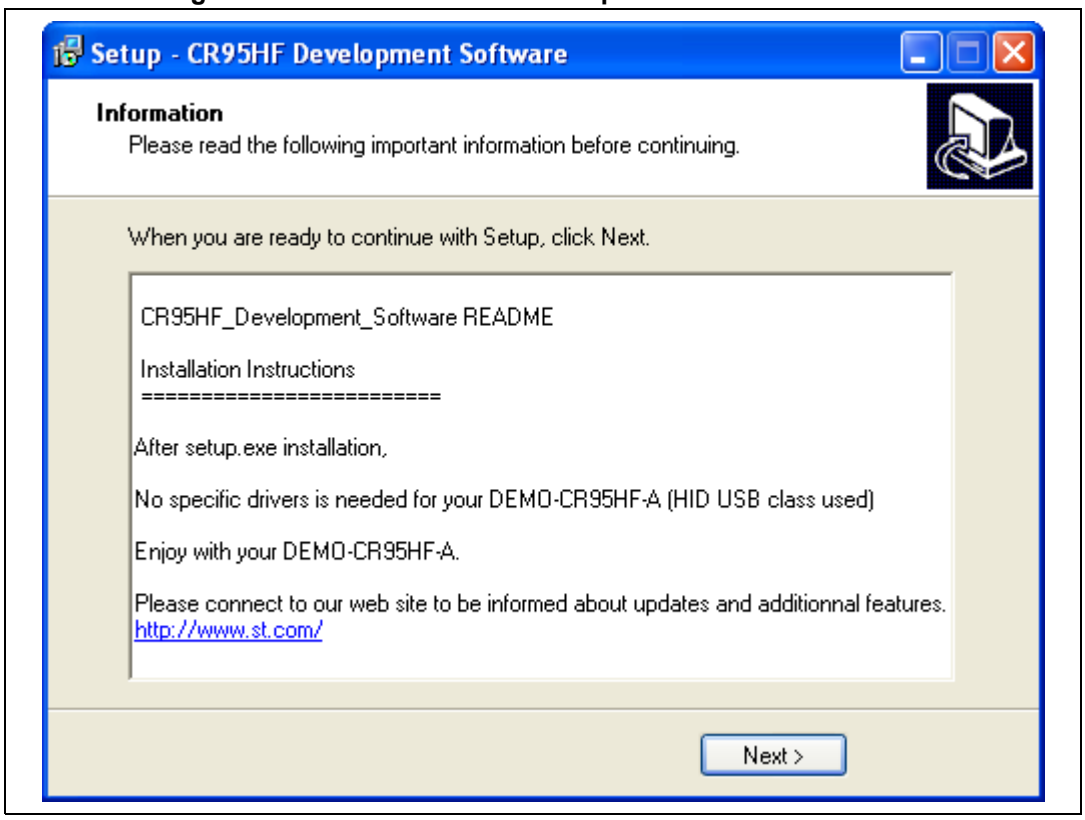


Figure 9. Launch the CR95HF development software



2 Using the CR95HF development software

2.1 Launching the CR95HF development software

Before launching the CR95HF development software, make sure that the DEMO-CR95HF-A board is connected to the USB port of your computer.

The on-board LED blinks to indicate that the board works properly.

When the CR95HF development software is launched, a DEMO-CR95HF-A detection process begins (see *Figure 10* and *Figure 11*) to check:

- the revision of the DLL installed on your computer
- the revision of the STM32 MCU firmware installed on your DEMO-CR95HF-A board
- the CR95HF identification number (IDN)

The objective of these checks is to verify that the DLL installed on your PC is up-to-date, and that your DEMO-CR95HF-A is ready to be used with the CR95HF development software.

If a problem occurs during the detection, the message shown in *Figure 12* is displayed.

Figure 10. DEMO-CR95HF-A detection message 1/3

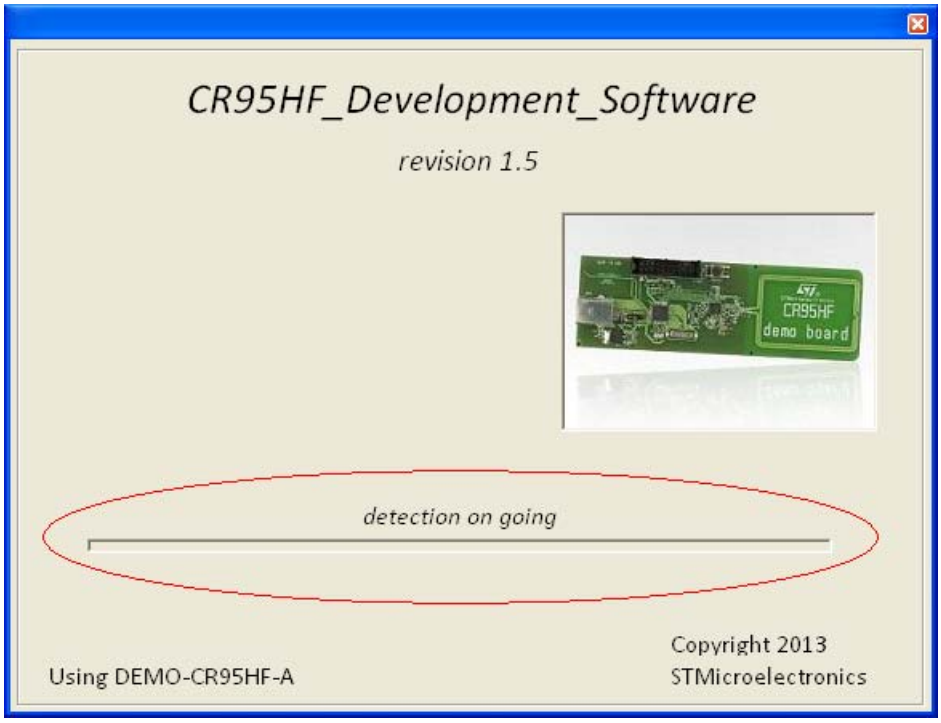


Figure 11. DEMO-CR95HF-A detection message 2/3

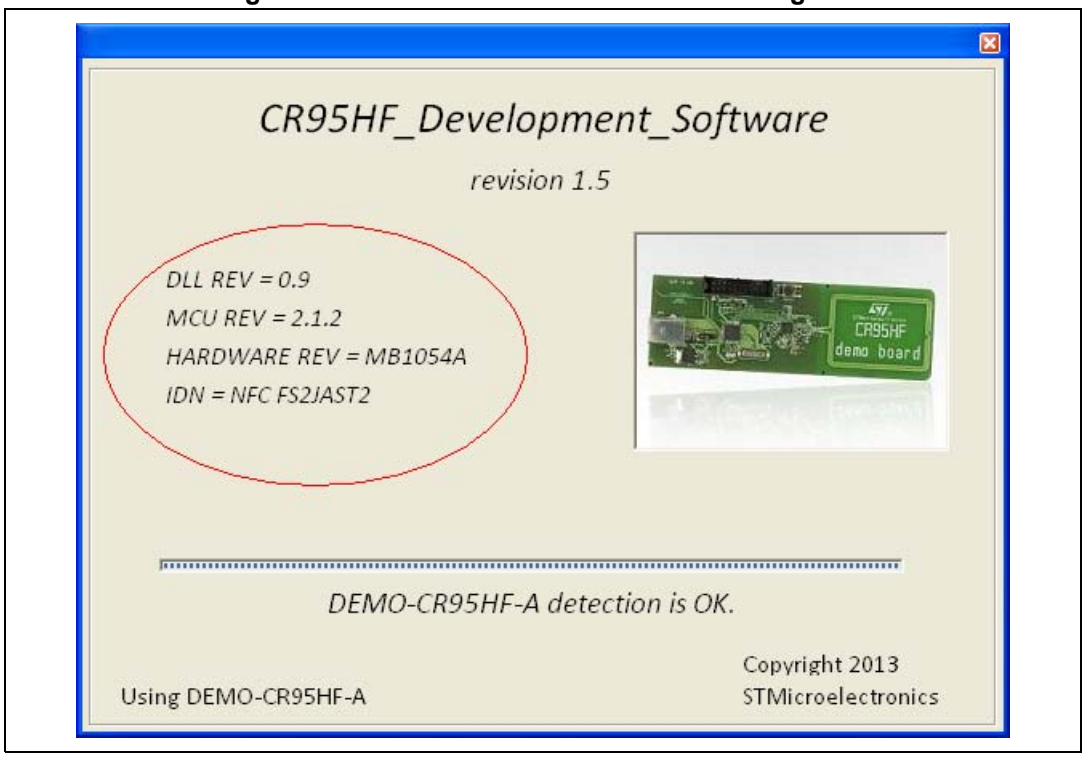


Figure 12. DEMO-CR95HF-A detection message 3/3



2.2 Main menu

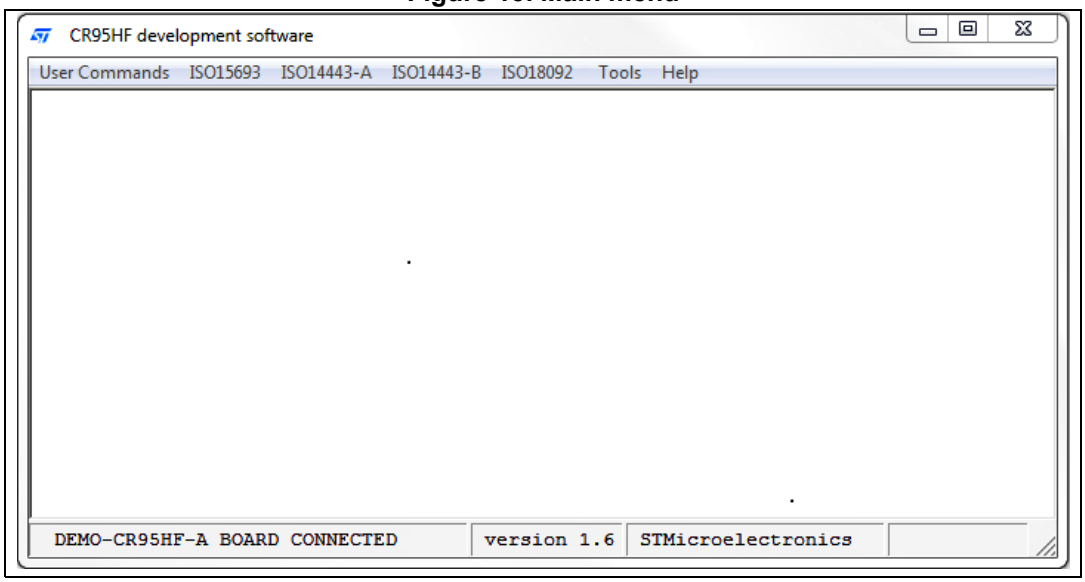
If the DLL has been installed correctly and the DEMO-CR95HF-A is connected to your PC USB port, the main menu is displayed to indicate that the software is running (see *Figure 13*).

Note: The software release number is shown at the bottom of the menu window.

This menu allows the user to access several sub-menus:

- **User commands** (see *Section 2.3*)
- **ISO15693** mode (see *Section 2.4*)
- **ISO14443-A** mode (see *Section 2.5*)
- **ISO14443-B** mode (see *Section 2.6*)
- **ISO18092** mode (see *Section 2.7*)
- **Tools** menu (see *Section 2.8*)
- **Help** menu (see *Section 2.9*)

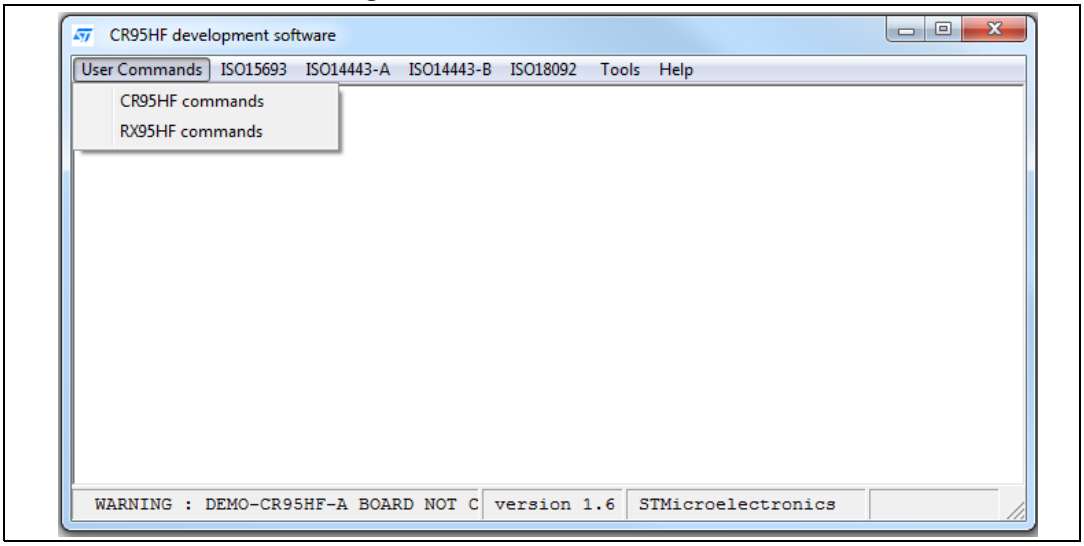
Figure 13. Main menu



2.3 User commands

This firt menu allows to access to all the commands described on the datasheet of the CR95HF IC and the RX95HF IC. You will be able to configurate and manage communication with the CR95HF IC or the RX95HF IC.

Figure 14. User command menu



2.3.1 CR95HF commands menu

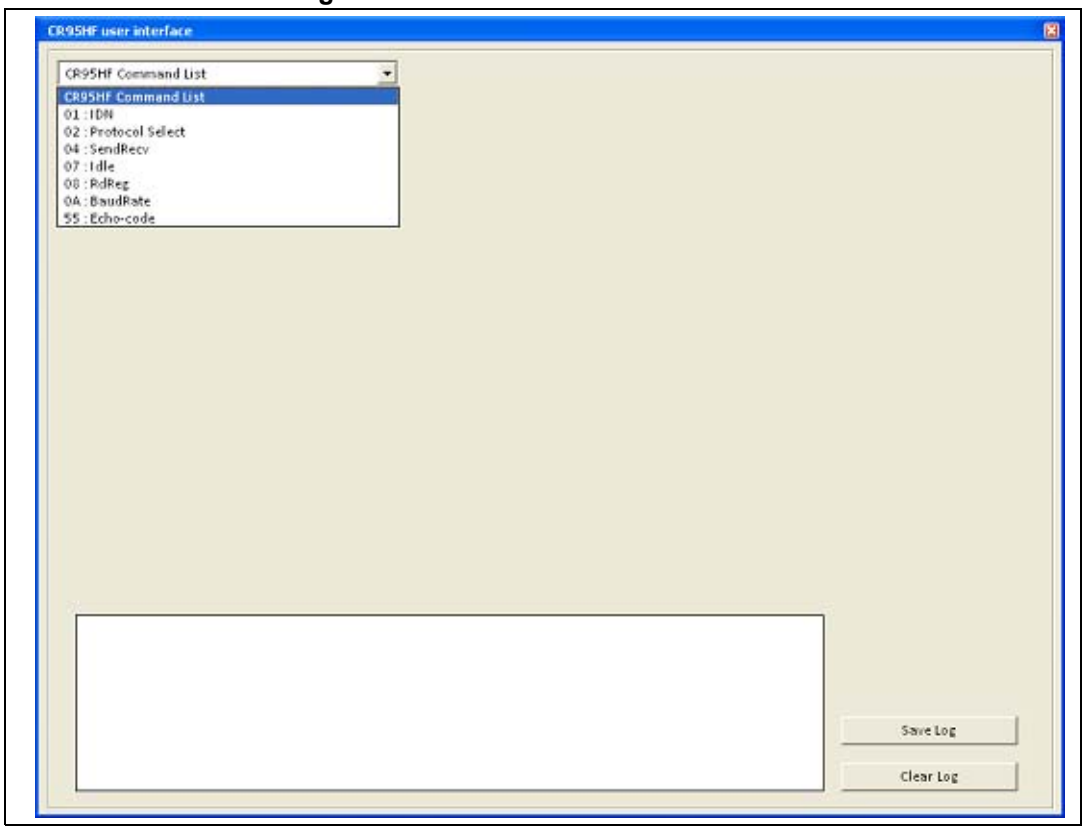
1. Select **CR95HF commands** from the main User command menu to communicate with the CR95HF embedded on your board and use all the commands and parameters described in the CR95HF datasheet (see *Figure 14*).
2. Select a command from the list (see *Figure 15*). The corresponding CR95HF command is sent to the DEMO-CR95HF-A. The selected parameters together with the board answer are displayed in the log window located at the bottom of the CR95HF user interface window.

   Two buttons are available from this menu:

- **Save Log** can be used to save the log content.
- **Clear Log** clears the log window.

  The following commands can be sent through the CR95HF user interface:
  - 01: IDN
  - 02: Protocol Select
  - 04: SendRecv
  - 07: Idle
  - 08: RdReg
  - 09: WrReg
  - 0A: Set UART baud rate
  - 55: Echo

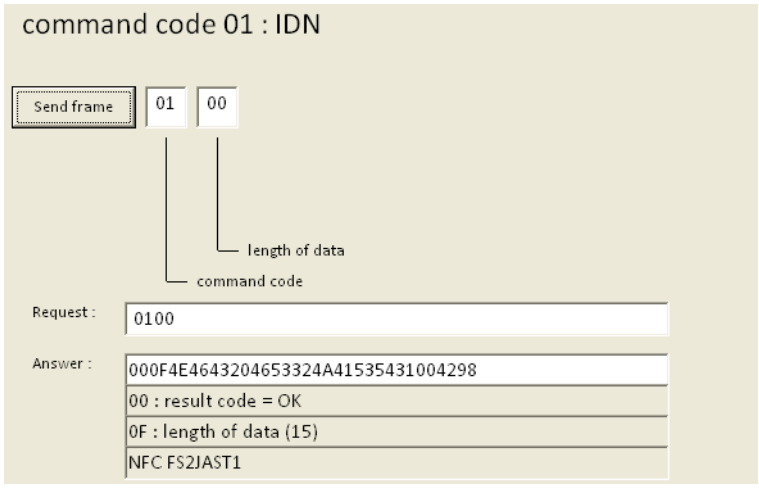
Figure 15. CR95HF user interface menu



01: IDN

Click **01: IDN** to request short information about the CR95HF and its firmware version (see *Figure 16*).

Figure 16. IDN window



02: Protocol Select

Click **02: Protocol Select** to select the communication protocol to be used between the CR95HF and the tags, or to switch the RF field off (see *Figure 17*):

- Click **00: Field OFF** to send a Field OFF command that turns the RF field off (see *Figure 18*).
- Click **01: ISO15693** to select and configure the ISO15693 communication protocol (see *Figure 19*).
- Click **02: ISO14443-A** to select and configure the ISO-14443-A communication protocol (see *Figure 20*).
- Click **03: ISO14443-B** to select and configure the ISO-14443-B communication protocol (see *Figure 21*).
- Click on **04: ISO18092** to select and configure the ISO-18092 communication protocol (see *Figure 22*).

Figure 17. Protocol Select window

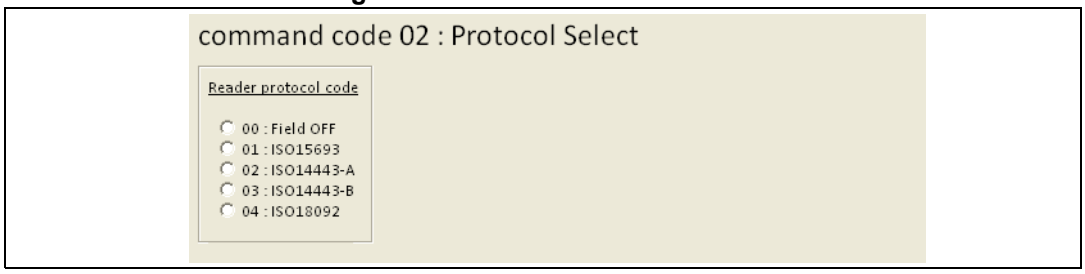


Figure 18. Field OFF window

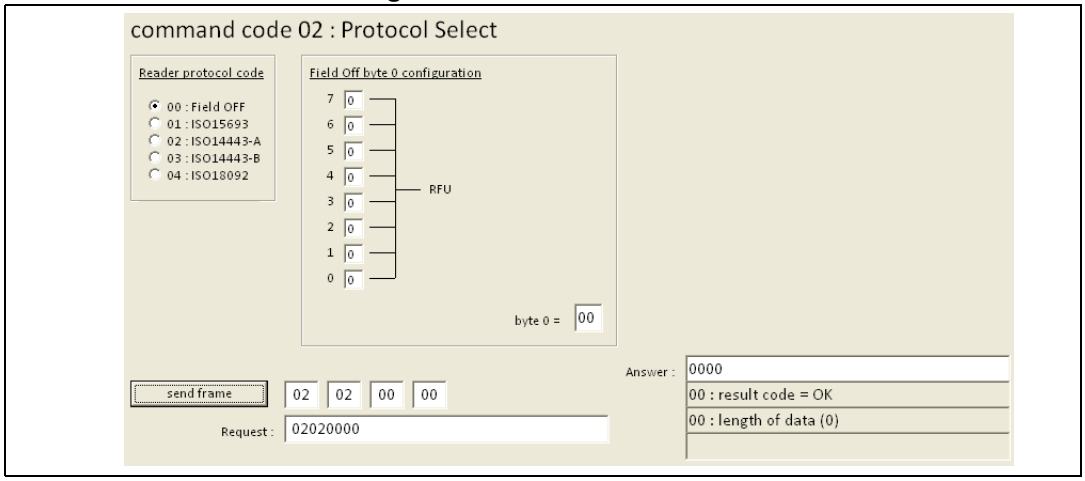


Figure 19. ISO15693 window

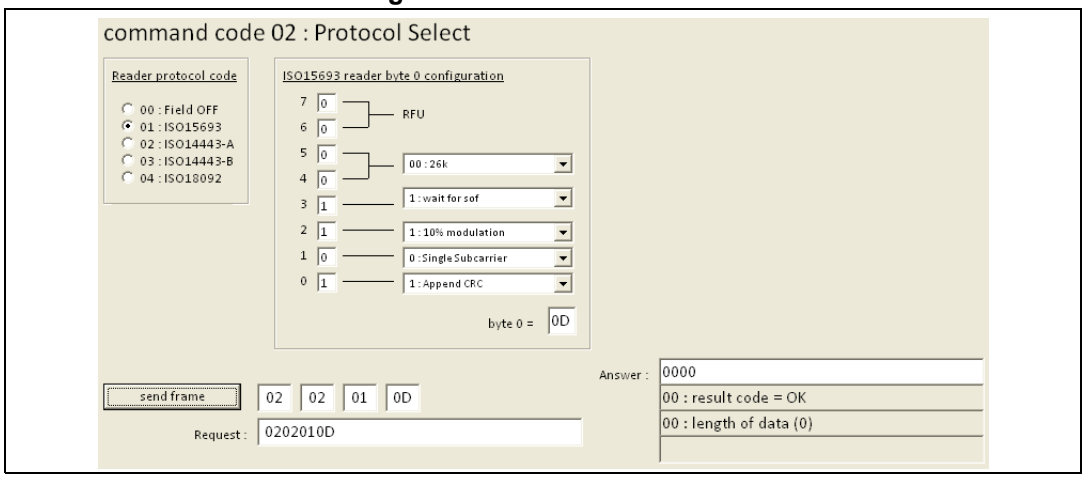


Figure 20. ISO14443-A window

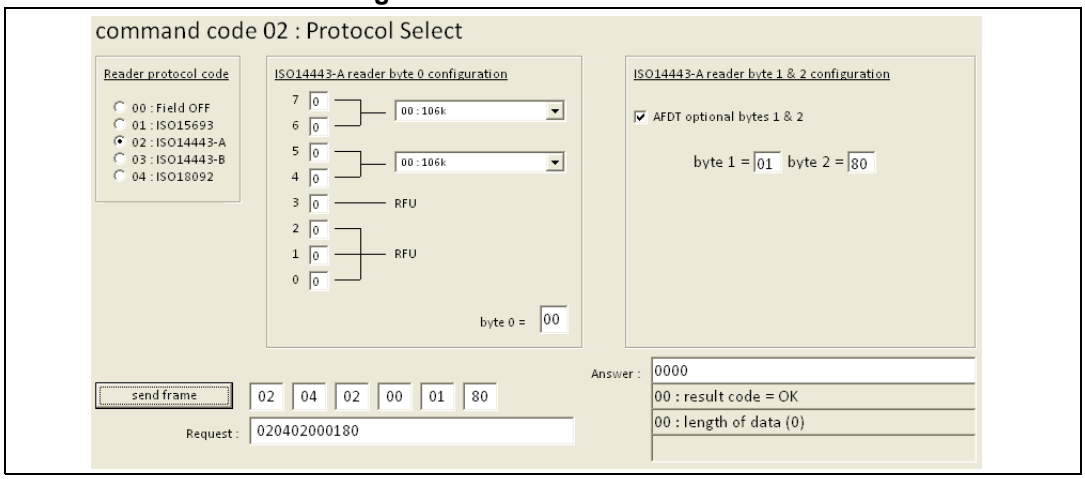


Figure 21. ISO14443-B window

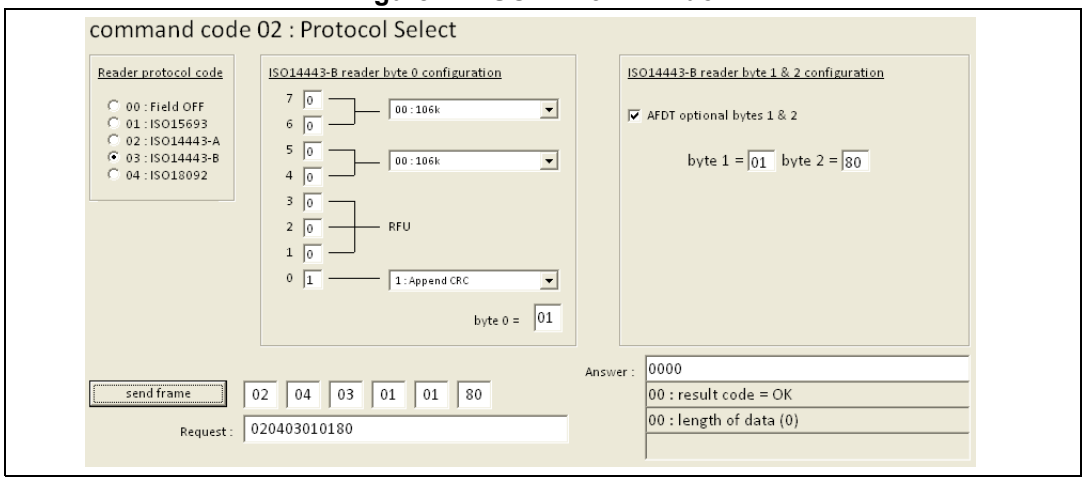
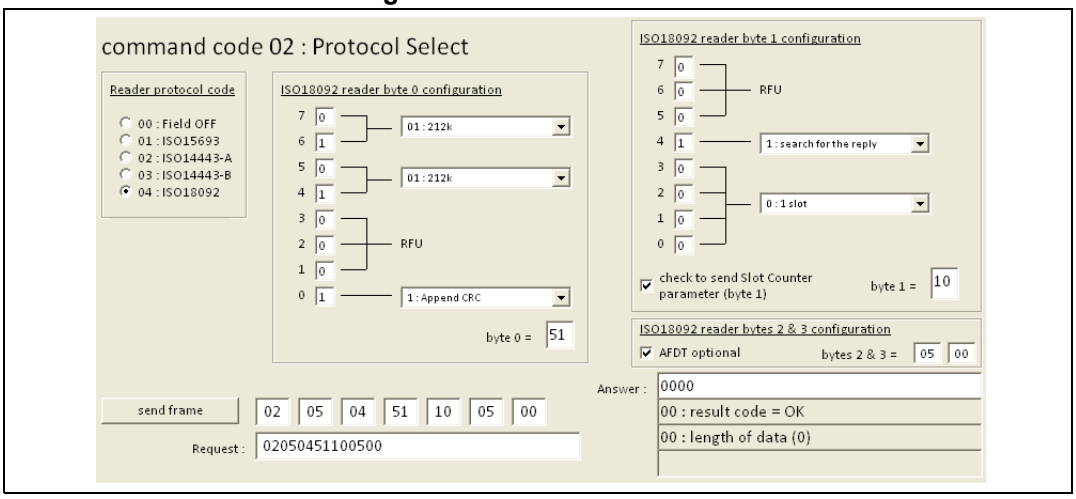


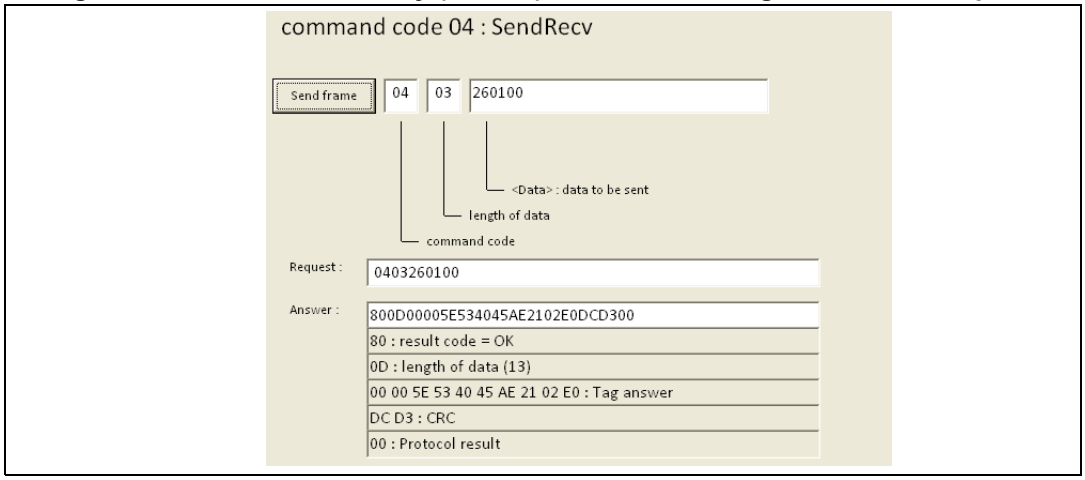
Figure 22. ISO18092 window



04: SendRecv

Click **04: SendRecv** to send data and receive the tag response using the previously selected protocol (see *Figure 23* for an example).

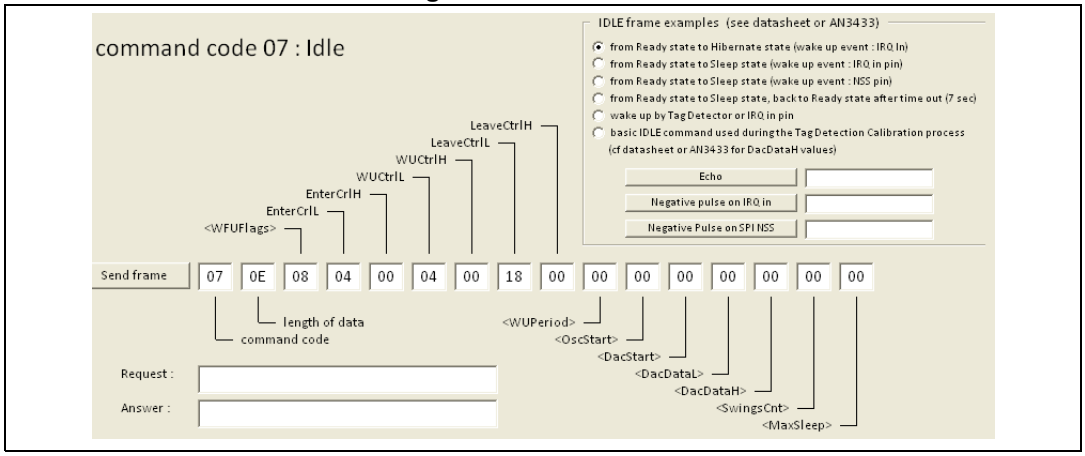
Figure 23. ISO15693 Inventory (260100) transmitted using a SendRecv request



07: Idle

Click **07: Idle** to switch the CR95HF to Tag Detection or Hibernate mode and specify the condition to exit this mode (see *Figure 24*).

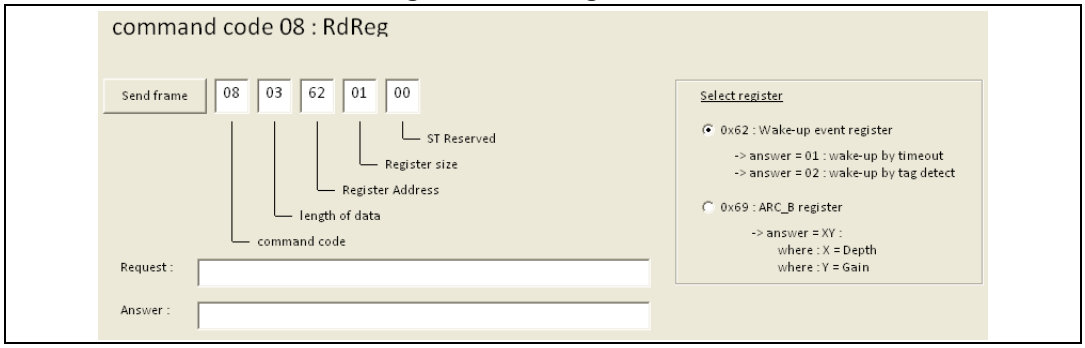
Figure 24. Idle window



08: RdReg

Click **08: RdReg** to read the Wakeup register (see *Figure 25*).

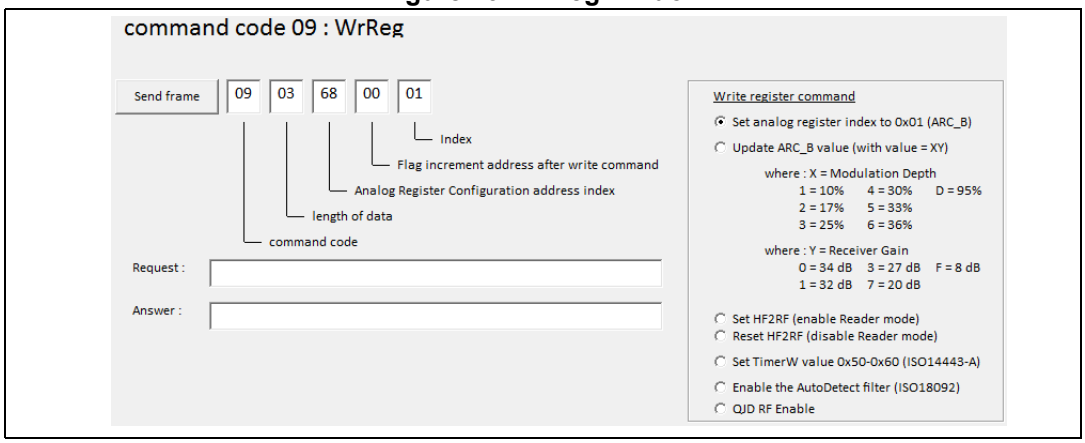
Figure 25. RdReg window



09: WrReg

Click 09: WrReg to set Analog refister and update ARC_B register (see Figure M)

Figure 26. WrReg window

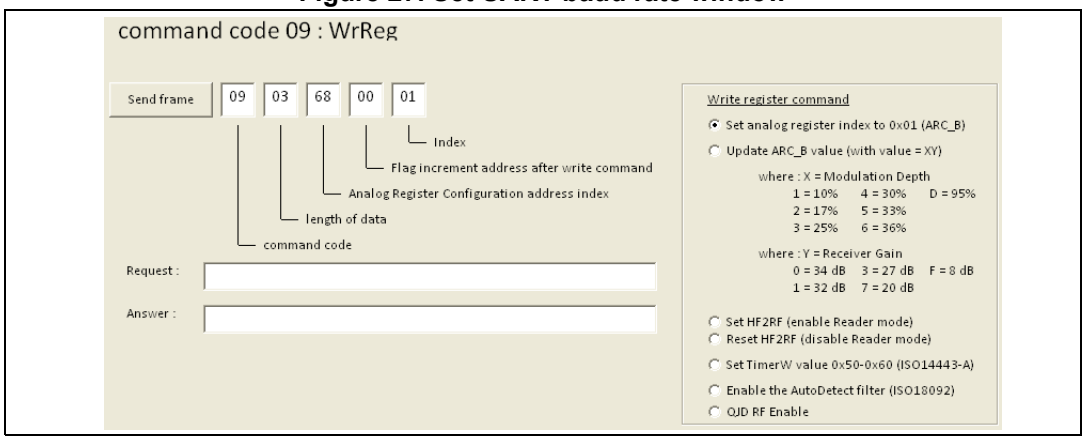


0A: Set UART baud rate

Click **0A: Set UART baud rate** to configure the UART data transfer (see *Figure 27*).

Note: The DEMO-CR95HF-A is delivered in SPI version. Contact your nearest ST sales offices to switch it to UART mode.

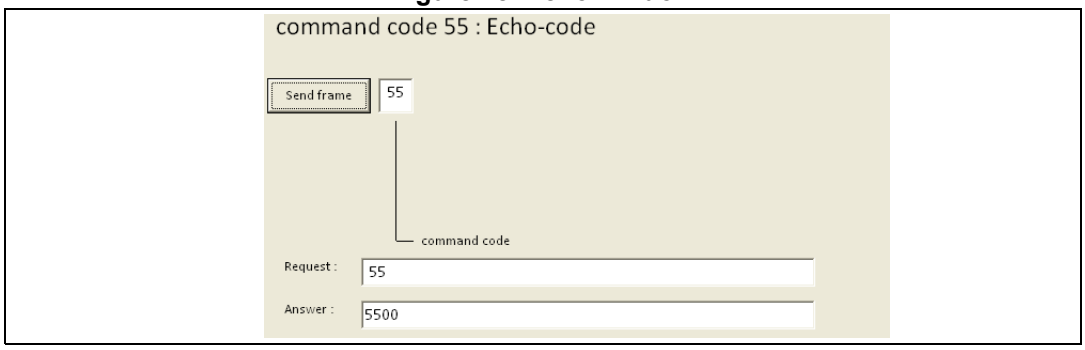
Figure 27. Set UART baud rate window



55: Echo

Click **55: Echo** to perform a serial interface echo (see *Figure 28*).

Figure 28. Echo window

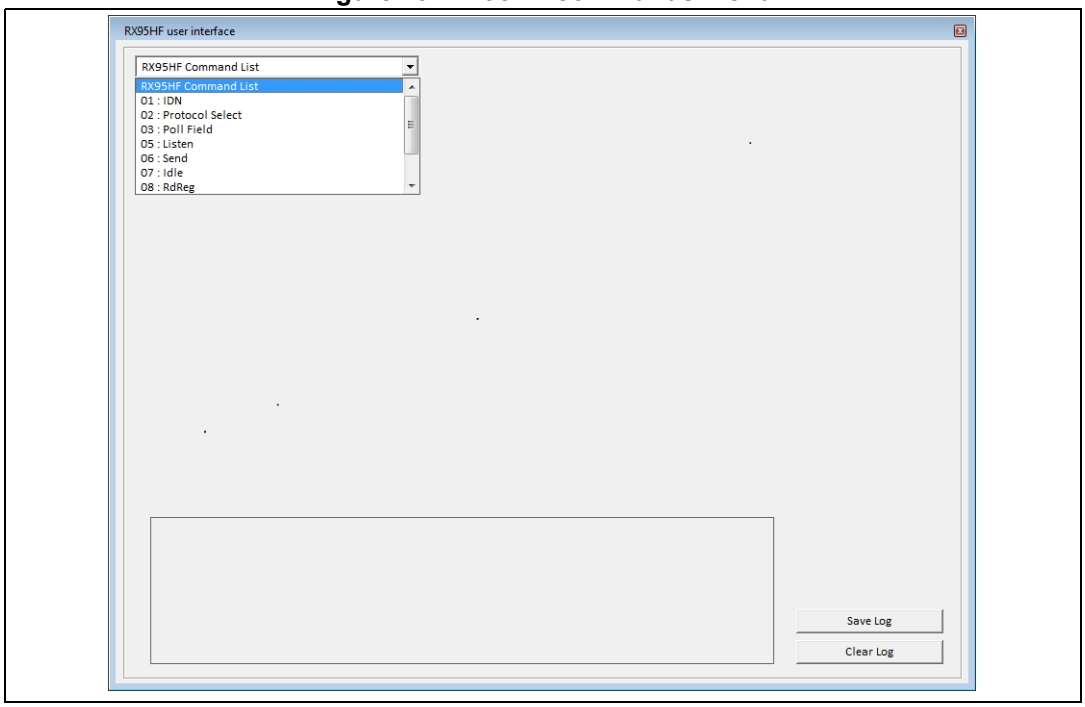


2.3.2 RX95HF commands menu

1. Select RX95HF commands from the menu User Commands to communicate with the RX95HF embedded on your board and use all the commands and parameters described in the datasheet (see *Figure 14*).

2. Select a command from the list (see *Figure 29*). The corresponding RX95HF command is sent to the DEMO-CR95HF-A. The selected parameters together with the board answer are displayed in the log window located at the bottom of the RX95HF user interface window.

Figure 29. RX95HF commands menu



Two buttons are available from this menu:

- Save Log can be used to save the log content.
- Clear Log clears the log window.

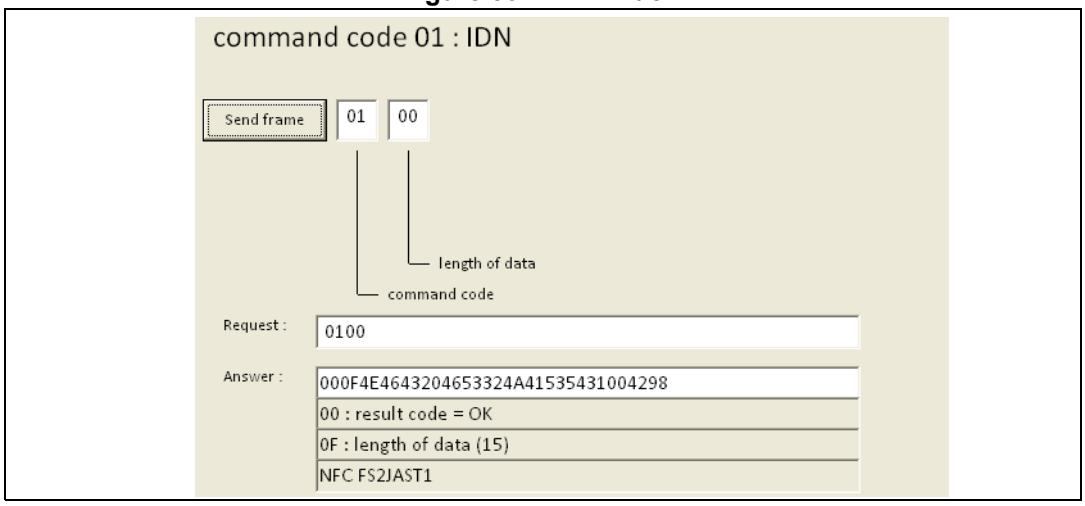
The following commands can be sent through the CR95HF user interface:

- 01: IDN
- 02: Protocol Select
- 03: Poll Field
- 05: Listen
- 06: Send
- 07: Idle
- 08: RdReg
- 09: WrReg
- 0D: AC filter
- 55: Echo

01: IDN

Click 01: IDN to request short information about the RX95HF and its firmware version (see *Figure 30*).

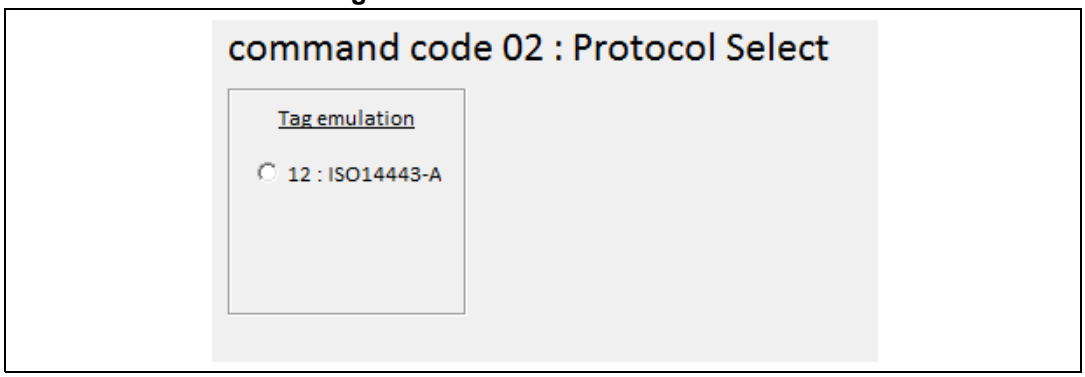
Figure 30. IDN window



02: PROTOCOL SELECT

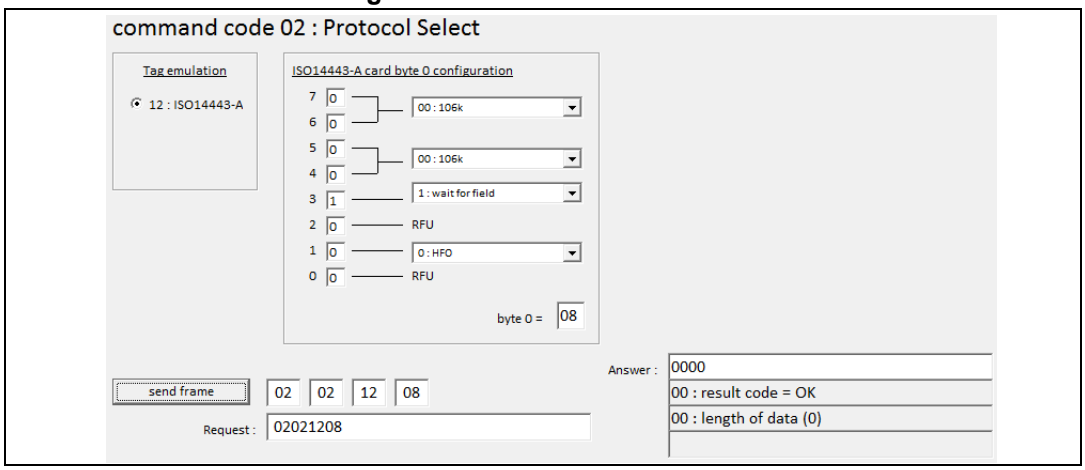
Click 02: Protocol Select to select the communication protocol to be used between the RX95HF and the transceiver (see *Figure 31*):

Figure 31. Protocol Select window



Click 12: ISO14443-A to select and configure the ISO-14443-A communication protocol for tag emulation (see *Figure 32*).

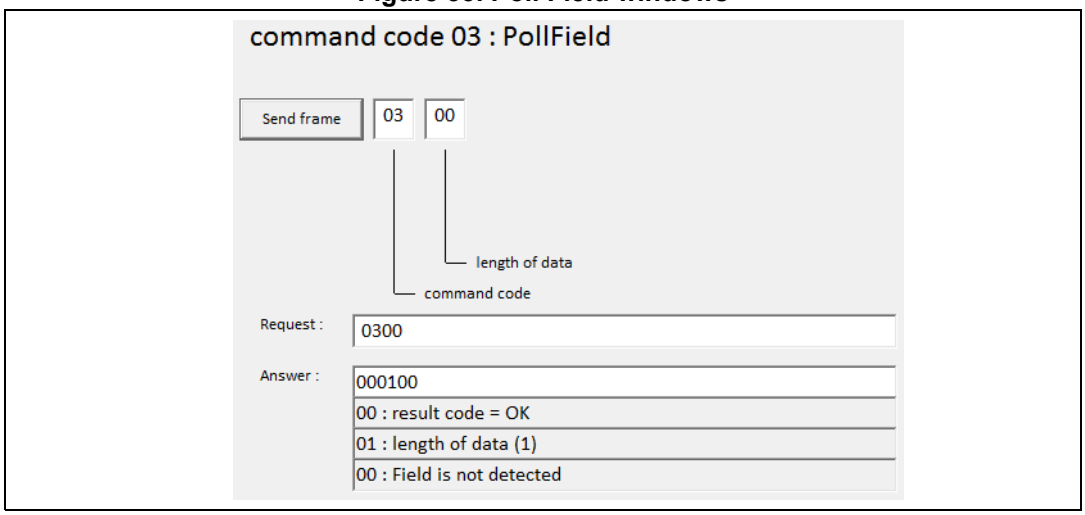
Figure 32. ISO14443-A windows



03: POLL FIELD

Click 03: Poll Field to be able to send Poll Field command. The result will inform the emulated tag of the presence of RF field. (see *Figure 33*):

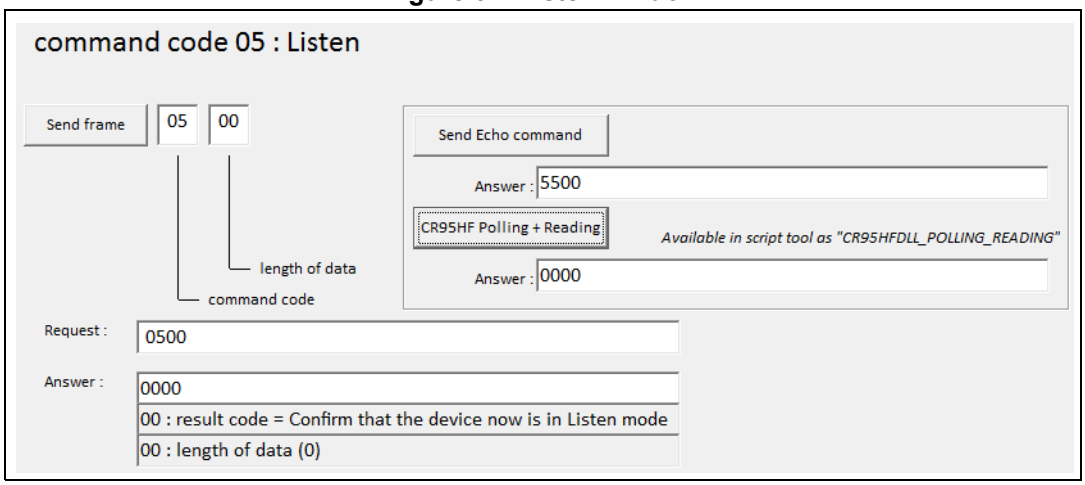
Figure 33. Poll Field windows



05: LISTEN

Click 05: Listen to be able to send Listen command. The result will inform if the emulated tag is in Listen mode (see *Figure 34*):

Figure 34. Listen window

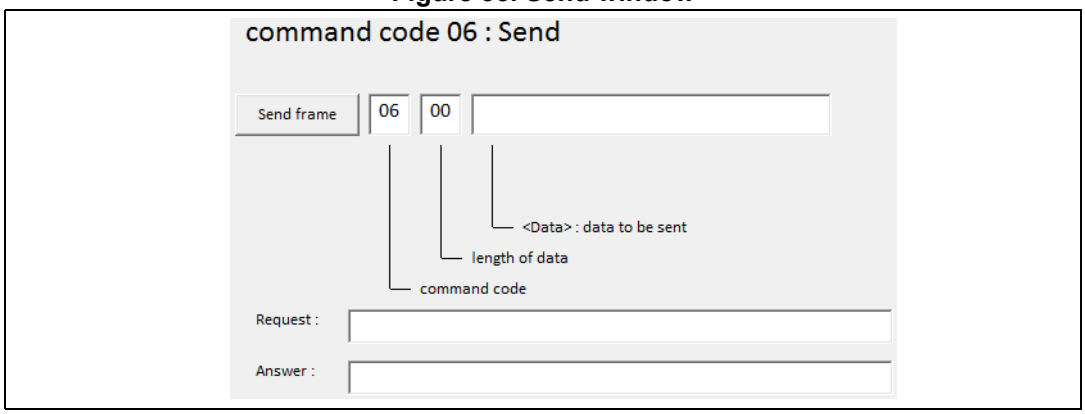


"Echo" command and "CR5HF Polling + Reading" command has been added to be able to play with Listen mode and control the state of the emulated tag.

06: SEND

Click 06: Send to be able to send Send command with some parameters. The parameters will be the answer of the emulated tag to the transceiver (see *Figure 35*):

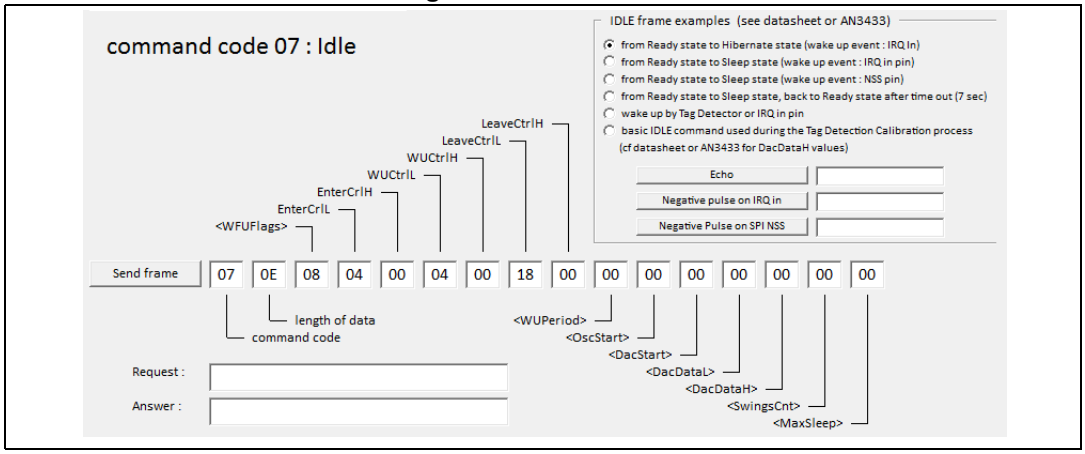
Figure 35. Send window



07: IDLE

Click 07: Idle to be able to send Idle command with some parameters. (see *Figure 36*):

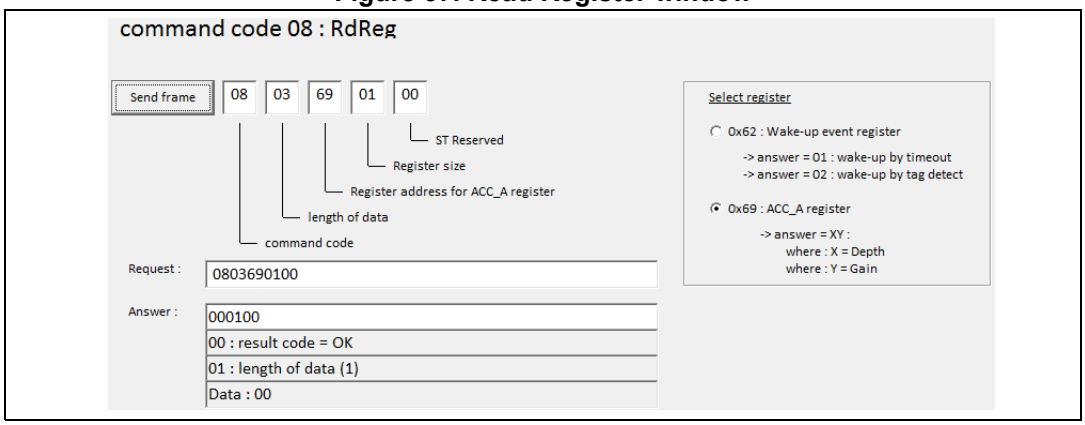
Figure 36. Idle window



08: RDREG

Click 08: RdReg to be able to Read ACC_A register or to send Wake-up event (see *Figure 37*):

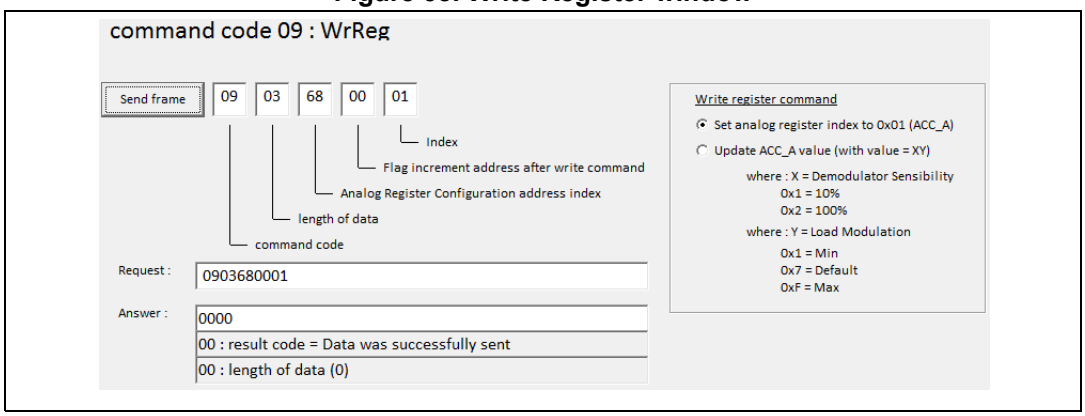
Figure 37. Read Register window



09: WRREG

Click 09: WrReg to be able to set Analog registers and update ACC_A register (see *Figure 38*):

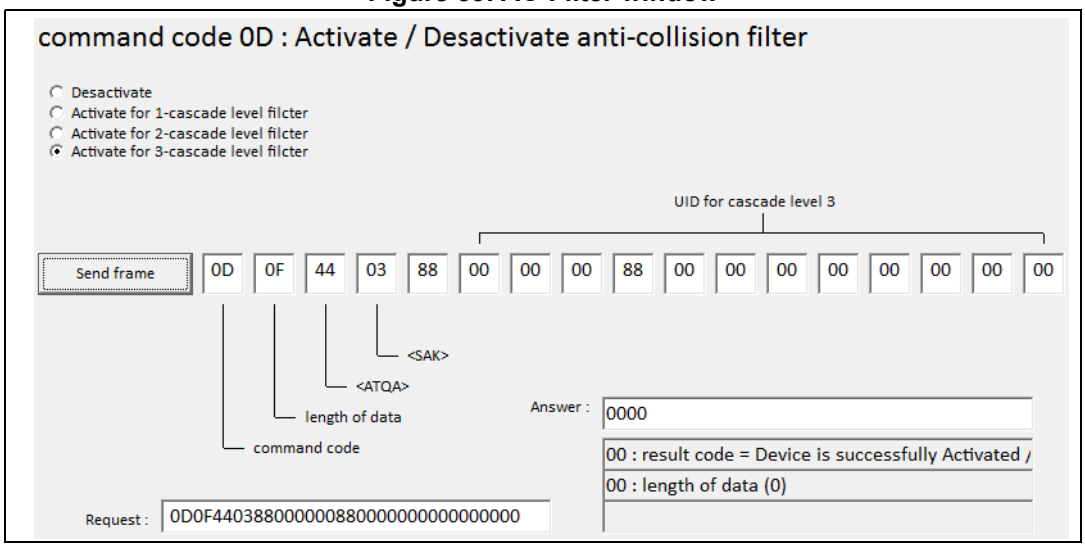
Figure 38. Write Register window



0D: AC-FILTER

Click 09: AC-Filter to be able to set ATQA, SAK and UID value for anticollision process (see *Figure 39*):

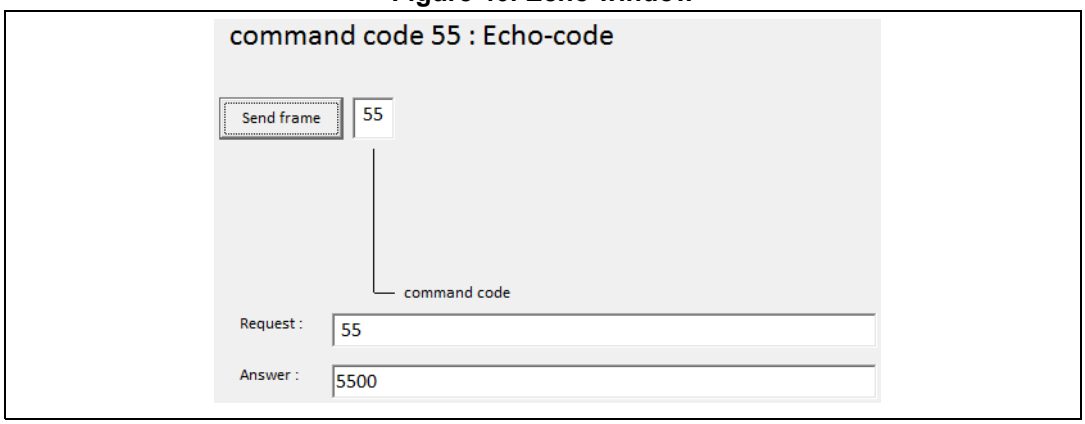
Figure 39. AC-Filter window



55: ECHO

Click 55: Echo to perform a serial interface echo (see *Figure 40*).

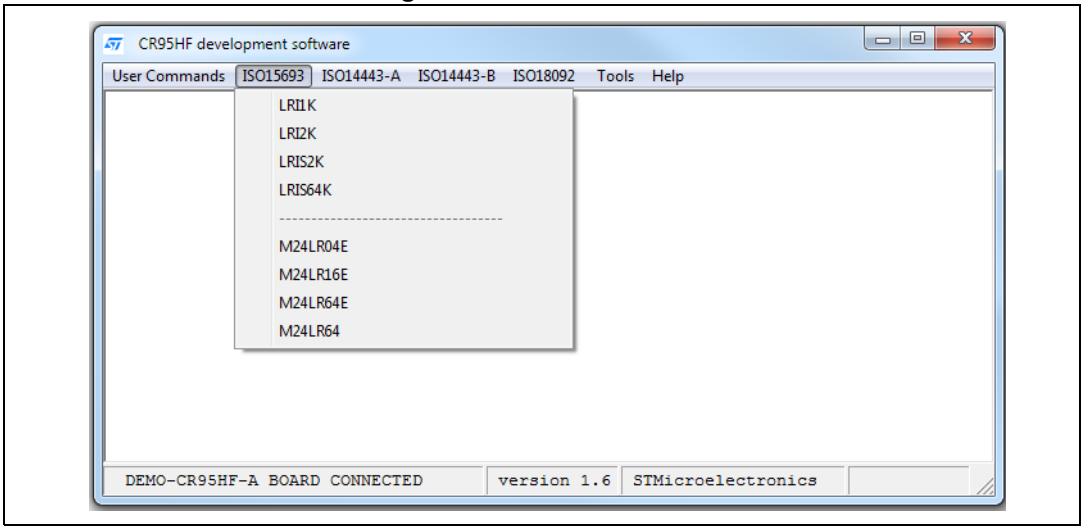
Figure 40. Echo window



2.4 ISO15693 menu

1. Select **ISO15693** from the main menu to use the DEMO-CR95HF-A as an ISO15693 reader. You can then choose between long range contactless memories and Dual Interface devices (see *Figure 41*).

Figure 41. ISO15693 menu



2. Select a device from the list (see *Figure 42* for an example). The board is then automatically configured as an ISO15693 reader, and the CR95HF can send/receive ISO15693 frames to/from the tags using the SendRecv command.

   ISO15693 communications are configured as follows:

   – 10% high data rate
   – One subcarrier

   The ISO15693 configuration is displayed in the log window.

   The upper part of the menu shows buttons which allow to send ISO15693 requests to a tag through the DEMO-CR95HF-A antenna. The main available requests are:

   – Inventory
   – Select
   – Stay Quiet
   – Reset to ready
   – Get system info
   – Initiate
   – Inventory initiated
   – Fast initiate
   – Fast Inventory initiated

   Refer to the CR95HF datasheet for the full list of ISO15693 commands.

   By default, the ISO15693 requests are sent in Non-selected/Non-addressed mode, and the requests are decoded by all the tags present in the RF field.

   To switch to Addressed mode, follow the steps below:

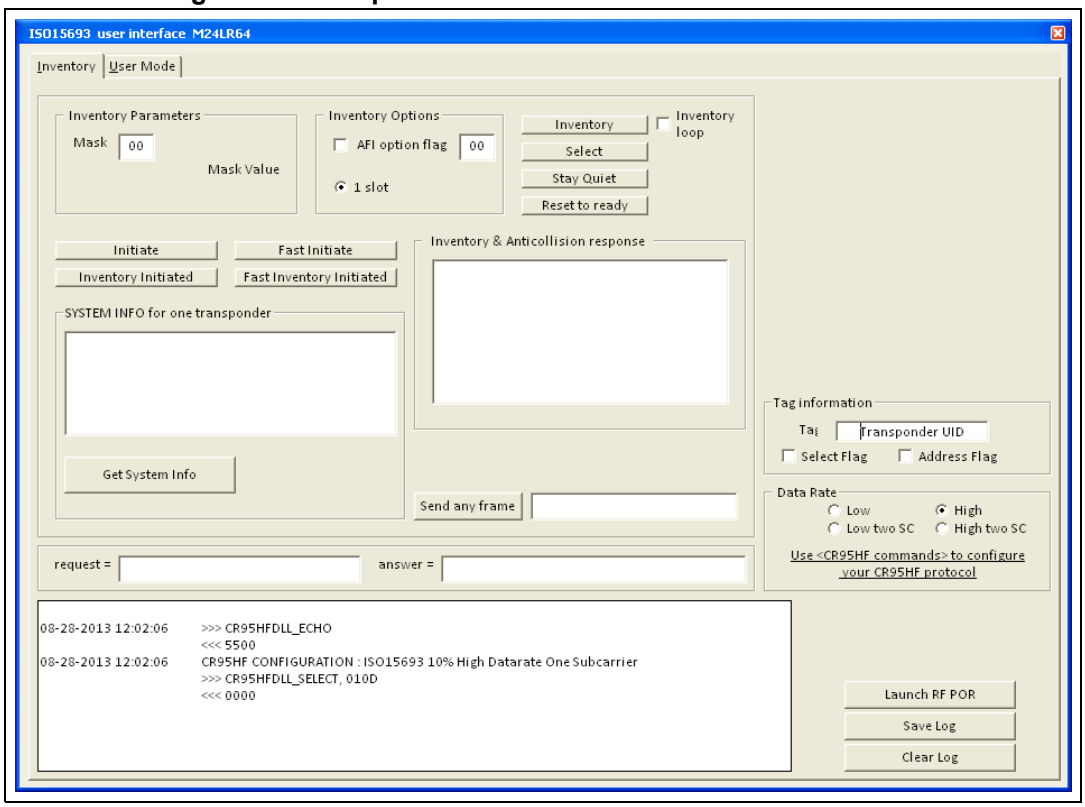
   a) Send an Inventory request to retrieve the tag UID.
   b) Click on the UID displayed in the **INVENTORY response** window to automatically copy the UID into the **Tag information** text box.
   c) Check **Address Flag** to activate the Addressed mode for the coming requests.

   The following sequence is required to switch to Selected mode:

   a) Send a Select request in Addressed mode (steps *a* to *c* above).
   b) Uncheck **Address Flag.**
   c) Check **Select Flag**.

   All the coming requests will be sent to the previously selected tag.

Figure 42. Example of ISO15693 user interface for M24LR64



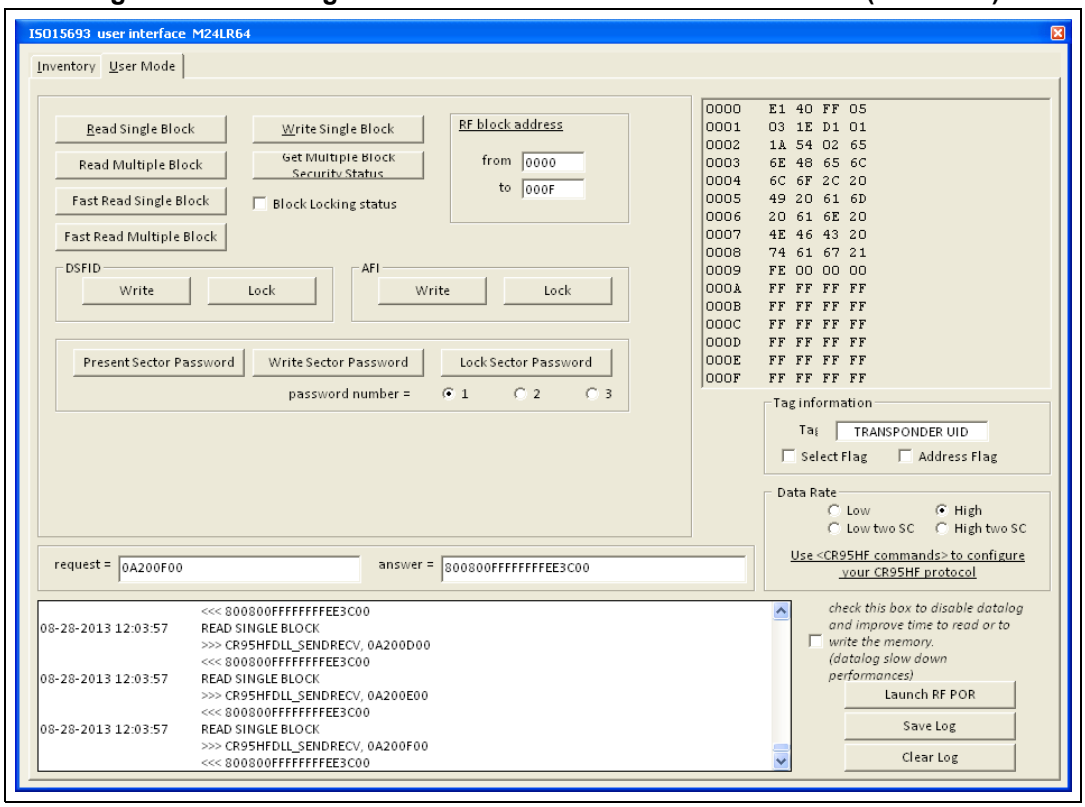
3. Click **User Mode** from the toolbar of the device ISO15693 user interface to display the ISO15693 requests that can be sent in User mode (see *Figure 43*). The main requests are:
   - Read single and multiple block(s)
   - Fast read single and multiple block(s)

     The DEMO-CR95HF-A is automatically configured in Fast mode, and put back in normal mode when the request is complete.

   Other requests are available (DSFID, AFI, ..). Refer to the device datasheet for the full list of ISO15693 requests available for a given product.

Note: The tag answer to a read request is displayed in the right part of the window.

Figure 43. Selecting User Mode from ISO15693 user interface (M24LR64)

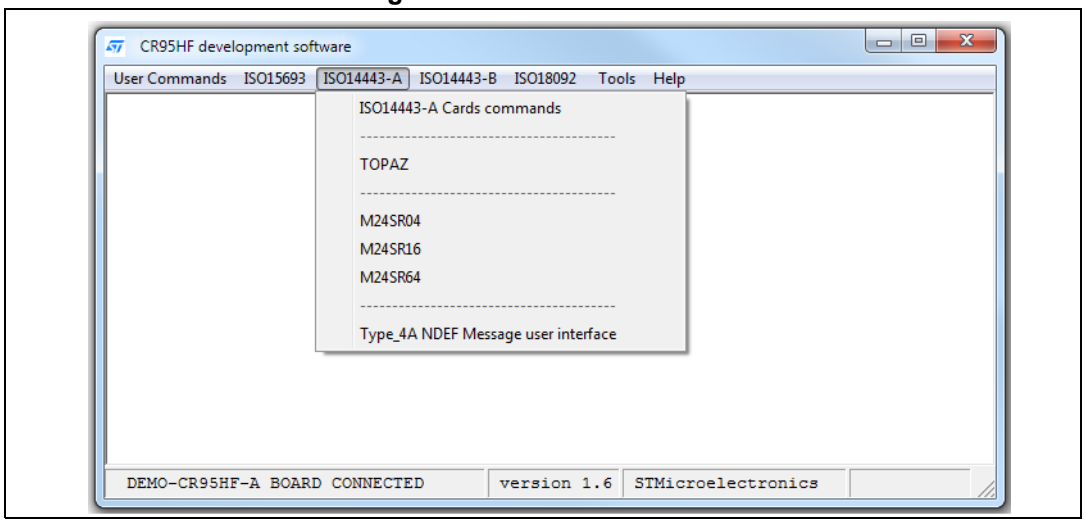


2.5 ISO14443-A menu

Select the ISO14443-A menu to launch one of the following user interface (see *Figure 44*)

- ISO14443-A Cards commands : (see *Section 2.5.1*)
  This menu allows the user to send any ISO14443-A requests
- TOPAZ (see *Section 2.5.2*)
  This menu allows the user to send any ISO14443-A requests to TOPAZ product
- M24SR04 M24SR16 M24SR64 (see *Section 2.5.3*)
  This menu allows the user to send any ISO14443-A requests or APDU request to M24SR product
- Type_4A NDEF Message user interface (see *Section 2.5.4*)
  This menu allows the user to read and write NDEF message to Tag Type 4A

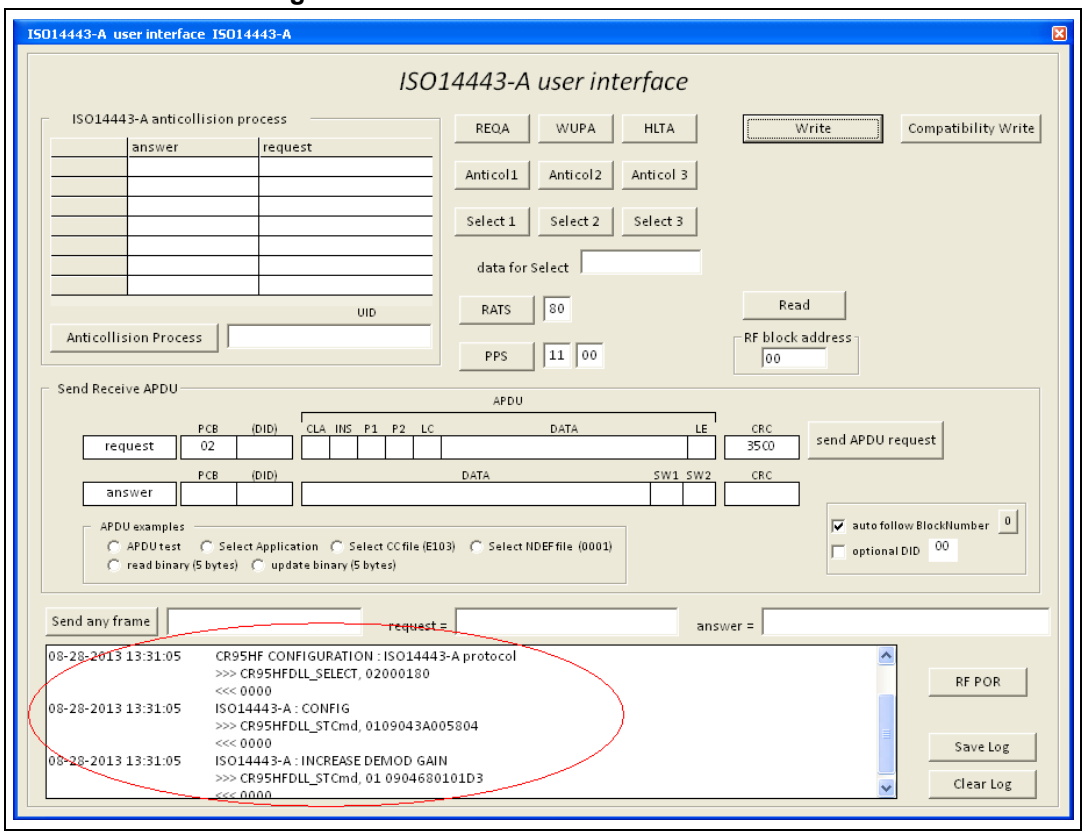
Figure 44. ISO14443-A menu



2.5.1 ISO14443-A Cards commands

Select ISO14443-A from the list (see *Figure 45* for an example). This automatically configures the board as an ISO14443-A reader and displays all the ISO14443-A requests.

Figure 45. ISO14443-A selected from the list



The ISO14443-A configuration is displayed in the log window as shown in *Figure 45*.

The upper part of the window contains buttons allowing to send ISO14443-A requests to tags through the DEMO-CR95HF-A board.

Refer to the device datasheet for the full list of ISO14443-A requests available for a given product.

Anticollision process will try to communicate with your Tag and try to select it. This automatic process is only for 1 tag.

It sends successively:

- ReqA
- Anticol1
- Select1
- Anticol2
- Select2
- Anticol3
- Select3

The process will be stopped as soon as an error occurs or if the anticollision process is finished (4 bytes or 7 bytes or 10 bytes UID).

Other commands can be sent such as:

- RATS
- PPS
- READ
- WRITE

Send Receive APDU can be used to send APDU requests.

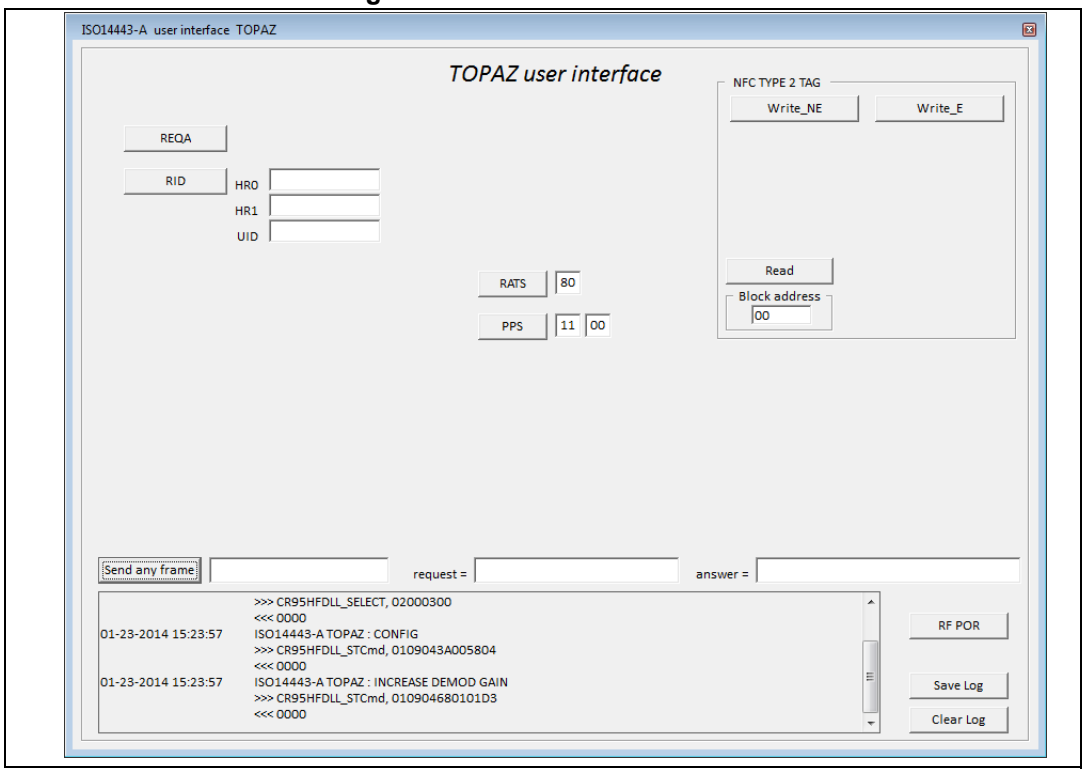
2.5.2 TOPAZ user interface

The TOPAZ configuration is displayed in the log window as shown in *Figure 46*

Some basic commands are available to be able to play with TOPAZ cards such as :

- REQA
- RID
- RATS
- PPS
- READ
- WRITE_NE
- WRITE_E

Figure 46. TOPAZ user interface



2.5.3 M24SR user interface

The M24SR user interface has been separated into two different windows to improve the visibility of the tool.

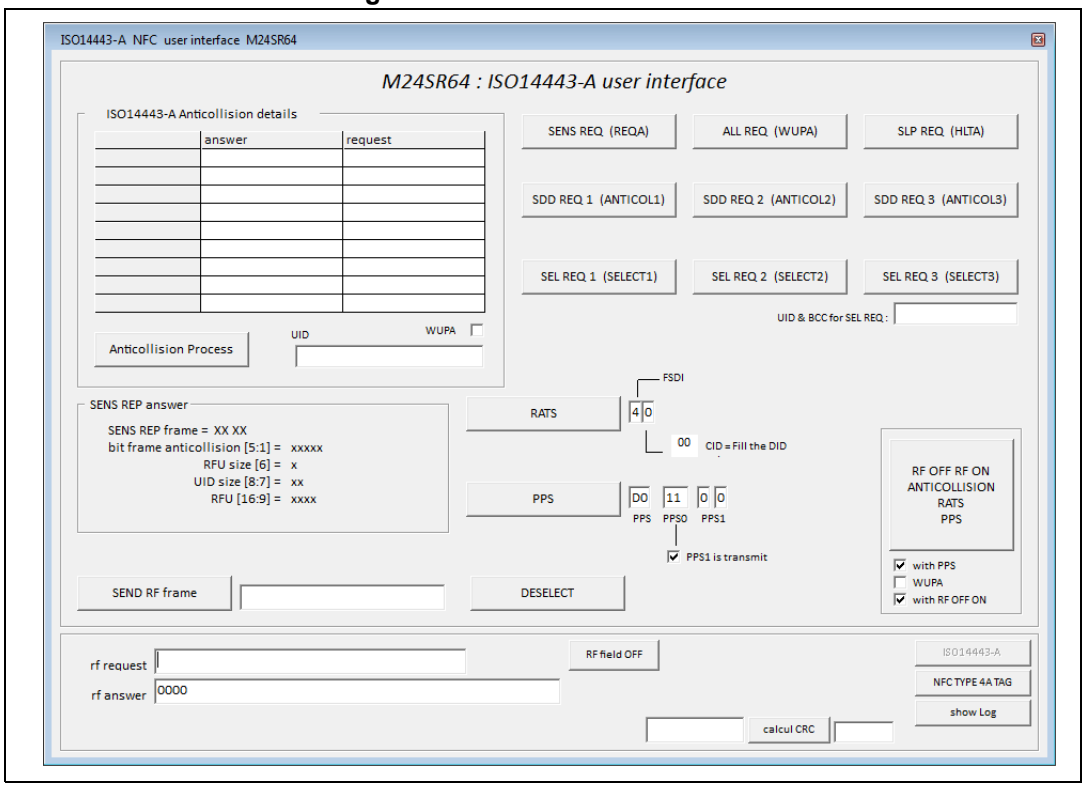
We have separated this two windows following the “life” of the M24SR (see *Figure 47*):

– after a RF POR or a deselect command, the M24SR is in the ISO14443-A world
– after RATS or PPS command, the M24SR enter in the NFC world.

First, select M24SR04 or M24SR16 or M24SR64 depending on the device to access along the device density.

When selecting the device, the ISO14443-A window appears.

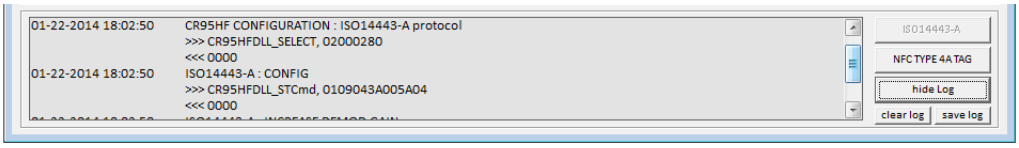
Figure 47. M24SR user interface



As soon as the windows appears, the ISO14443-A protocol selection is done in background.

Click on show log to display the log window and see the CR95HF protocol selection sequence (see *Figure 48*)

Figure 48. CR95HF protocol selection sequence



ISO1443-A screen

The first screen (see *Figure 47*) is displayed when the M24SR is selected in the option menu. Several buttons are displayed in this window. The buttons represent all the available commands in the ISO14443-A world:

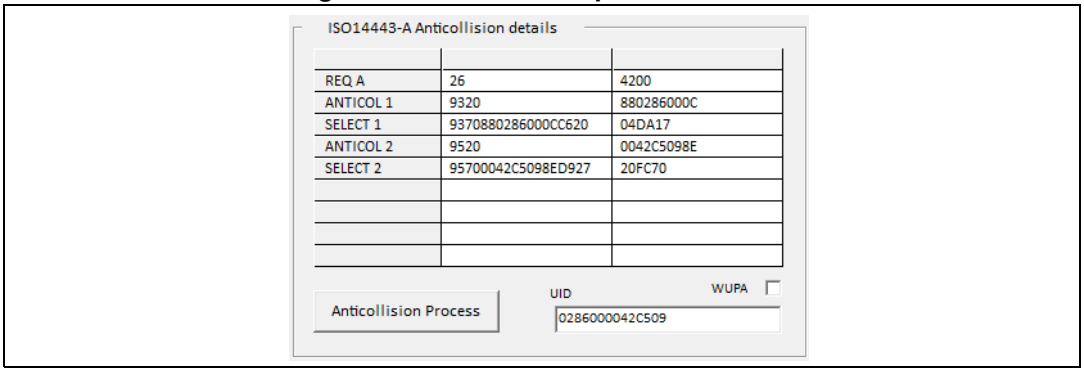
Some buttons are used to send single commands:

- **SENS REQ (REQA)**: send a REQA to the M24SR
- **ALL REQ (WUPA)**: send WPUA command to the M24SR
- **SLP REQ (HLTA)**: send HLTA command to the M24SR
- **SDD REQ 1 2 3 (ANTICOL 1 2 3)**: send Anticol command to the M24SR
- **SEL REQ 1 2 3 (SELECT 1 2 3):** send Select command to the M24SR
- **RATS**: send RATS command to the M24SR
- **PPS**: send PPS command to the M24SR
- **DESELECT**: send Deselect command to the M24SR

Two additional buttons allow to accelerate the communication with the M24SR:

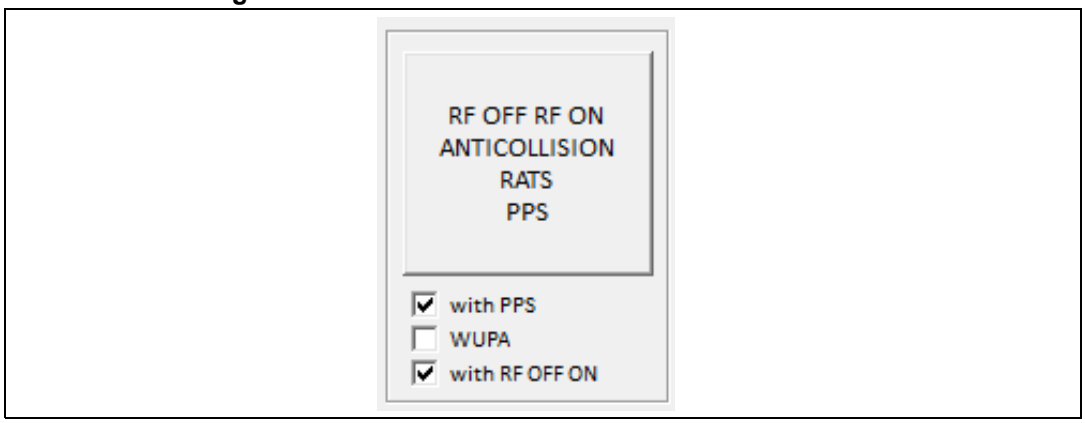
- **Anticollision Process** button
  can be used to detect a Tag and read the UID of this tag
  when clicking on this button, the anticollision sequence is sent (beginning by a REQA or WUPA) depending of the Option button.
  The REQA/WUPA answer is detailled in SENS REQ answer screen.
  The anticollision sequence is summarized in the array.
  The sequence is launched and stopped when an error occurred.
  At the end of the sequence, if no error is found, the UID of the selected M24S is displayed in UID field as show on *Figure 49*

Figure 49. Anticollision process results



- **RF OFF RF ON ANTICOLLISION RATS PPS** button
  can be used the whole anticollision process with RATS with PPS to reach NFC type 4A world.
  This button can be configured by enabling or disabling
  - RF OFF/ON
  - Replace REQA command by WUPA command
  - PPS request added to the sequence

Figure 50. RF OFF on autocollision RATS PPS button



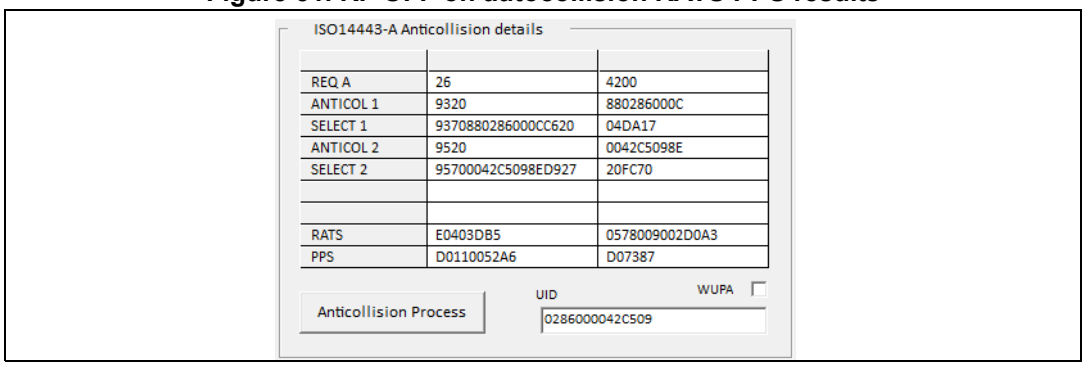
The sequence is launched and stopped when an error occurred.

At the end of the sequence, if no error is found,

- The UID of the selected M24SR is displayed in UID field.
- RATS answer
- PPS Answer (if option selected)
- The log windows is filled with RF request & RF answer

As shown on *Figure 51*

Figure 51. RF OFF on autocollision RATS PPS results

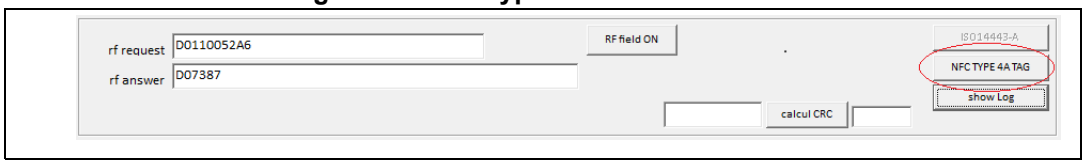


At the end of this action, if no error is occurred and M2SR answers are Ok, the window will automatically switch to the windows called **NFC Type 4A**.

How to access to ISO14443-A command and NFC Type 4A commands:

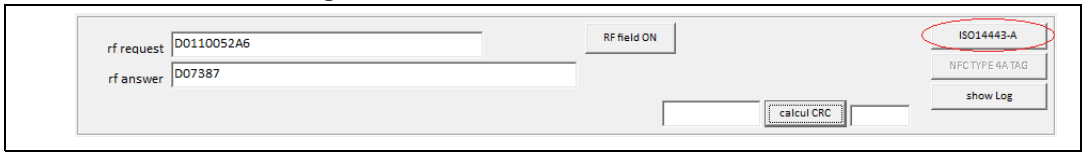
– When the ISO14443-A windows is displayed, the “NFC Type 4A” button is available to switch to NFC Type 4A window.
See *Figure 52*

Figure 52. NFC Type 4A button available



– When the NFC Type 4A windows is displayed, the **ISO14443-A** button is available to switch to iso14443-A window.
See *Figure 53*

Figure 53. ISO14443-A button available



As already explained in the user manual, the “RF request” and “RF answer” fields contains the send command and the answer from M24SR.

Figure 54. RF request and RF answer

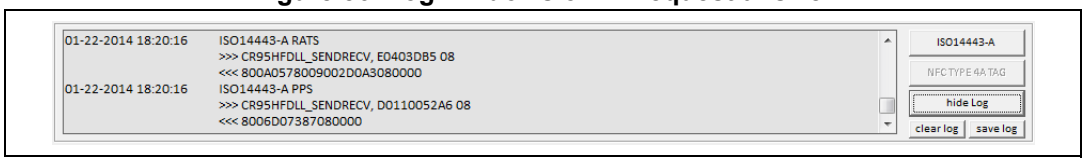


The **show log** button is available to be able to see the history of RF request and RF answer. See *Figure 55* and *Figure 56*.

Figure 55. “Show Log” button



Figure 56. Log windows of RF request/answer

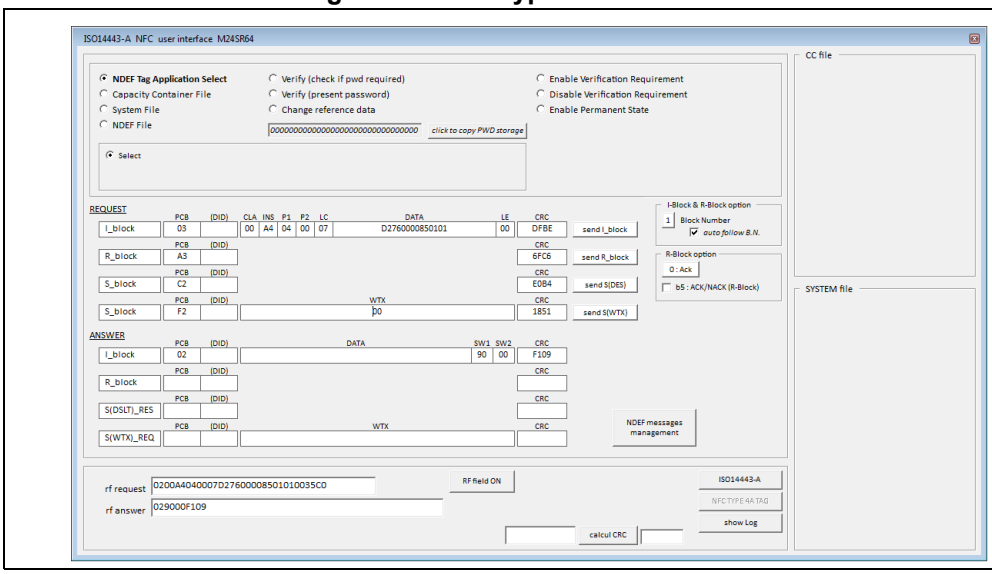


The formatted request (ex: CR95HFDLL_STCmd, 010904680101DF) can be used in script tool.

NFC Type 4A screen

This window will allows to send NFC APDU requests to be able to play with the M24SR tag in NFC world (see *Figure 57*). This window is automatically reached when the "RF OFF RF ON ANTICOLLISION RATS PPS" button is used and all the processes are done successfully or when the user click on "NFC Type A" button.

Figure 57. NFC Type 4A user interface

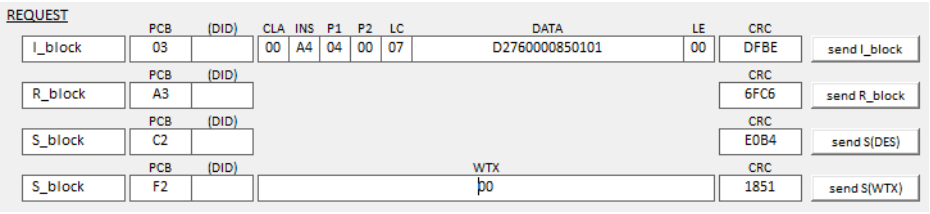


The middle part of the window is used to generate the RF frame to be sent to the M24SR: I_Block, R_Block, S(DES)_Block and S(WTX)_Block request.

All this field can be changed by clicking and modifying data

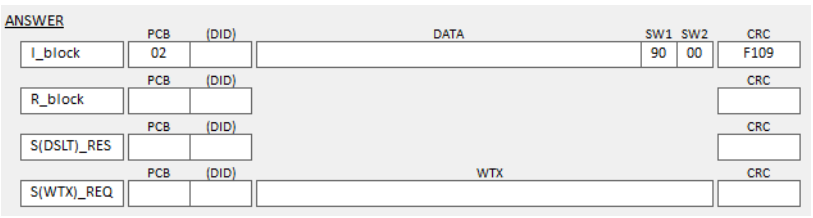
Four buttons are available to send I_Block, R_Block, S_Block requests.

Figure 58. I_Block, R_Block, S_Block requests



The answer of the M24SR is filled in I_Block, R_Block, S_Block answer fields depending on the request sent to the M24SR.

Figure 59. I_Block, R_Block, S_Block answer



The higher part of the window can be used to automatically fill the I_Block request.

The goal is to facilitate the communication with the M24SR (following NFC forum and M24SR datasheet).

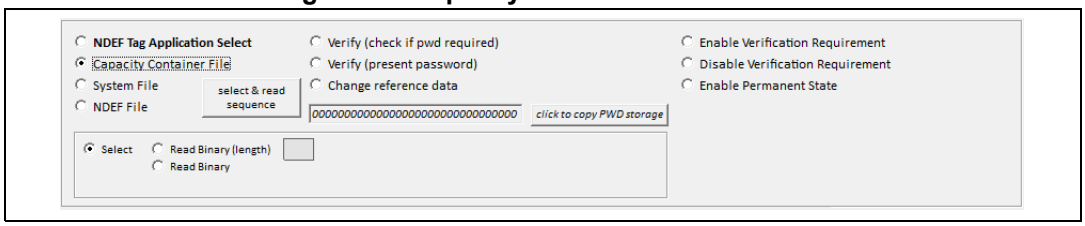
Several option buttons are available:

- **NDEF Tag Application select**
  When this option is selected, the I_Block frame is filled with adequate data.

Once the command option is selected, the data in I_Block rf frame are filled, you can press the button “send I_Block” to send RF frame.

- **Capacity Container file**
  Selecting Capacity Container File option will allow other option to appear
  clicking on one of this option will fill, the I_Block frame is filled with adequate data.

Figure 60. Capacity container file selected



– **Select command**:
fill data with CC file Select command

– **Read binary (length) command**
fill data with read binary command on CC file in order to read the length of the cc file

– **Read binary command**
fill data with read binary command on CC file

Once the command option is selected, the data in I_Block rf frame are filled, you can press the button “send I_Block” to send RF frame.

– **Select & read sequence** button will launch automatically all the procedure and will display it in a CC file result window

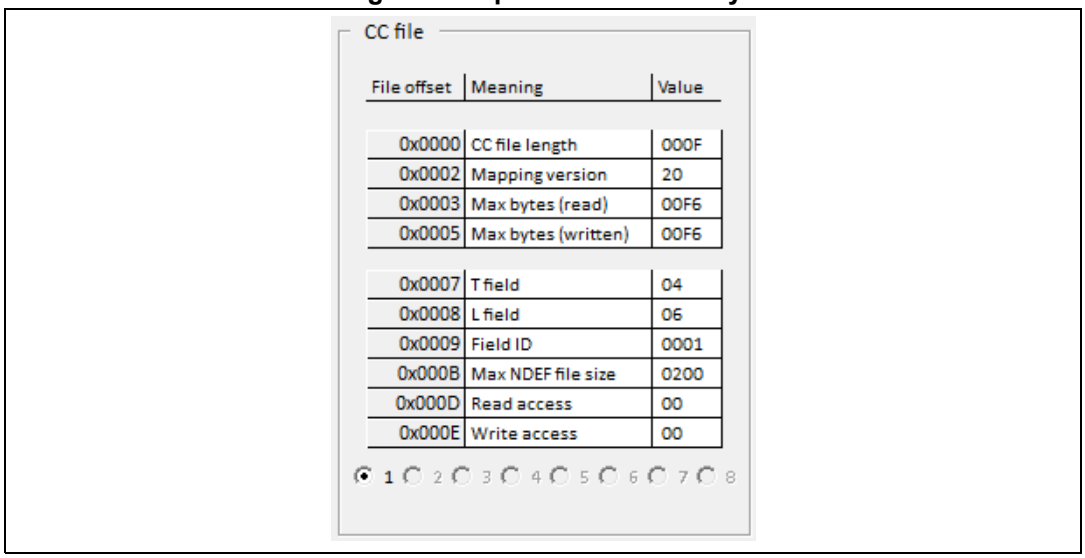
Select cc file

Read cc file length

Read cc file data

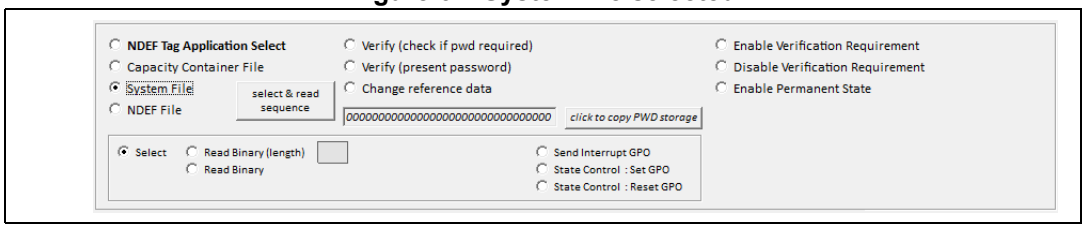
Display data in a specific CC file array (available only of no error detected)

Figure 61. Specific CC file array



- **System file**
  Selecting System File option will allow other option to appear.
  Clicking on one of this option will fill, the I_Block frame is filled with adequate data.

Figure 62. System file selected



  - **Select command**:
    fill data with System file Select command
  - **Read binary (length) command**:
    fill data with read binary command on System file in order to read the length of the system file
  - **Read binary command**:
    fill data with read binary command on System file
  - **Send Interupt GPO**
  - **State control: Set GPO**
  - **State control: Reset GPO**

Once the command option is selected, the data in I_Block rf frame are filled, you can press the button send I_Block to send RF frame.

  - **Select & read sequence** button will launch automatically all the procedure and will display it in System file result window

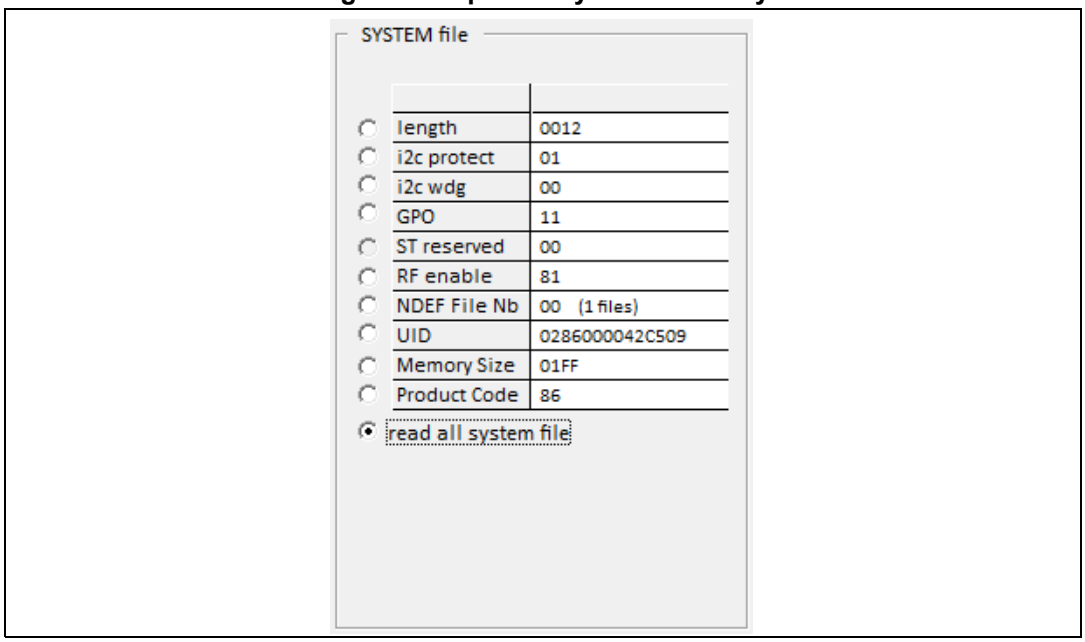
    Select system file

    Read sytem file length

    Read system file data

    Display data in a specific System file array (available only of no error detected)

Figure 63. Specific system file array

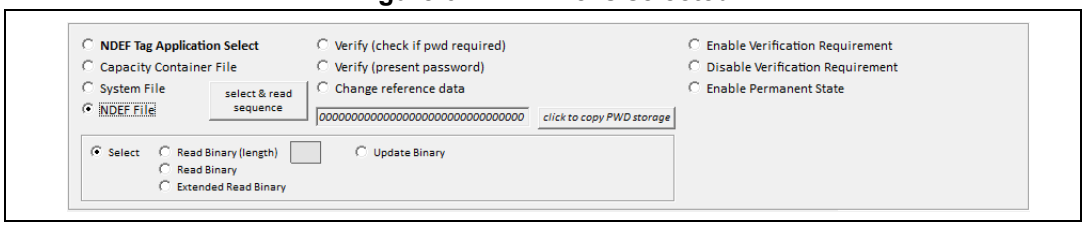


- **NDEF file**

Selecting NDEF File option will allow other option to appear.

Clicking on one of this option will fill, the I_Block frame is filled with adequate data.

Figure 64. NDF file is selected



– **Select command**:
fill data with NDEF file Select command

– **Read binary (length) command**:
fill data with read binary command on NDEF file in order to read the length of the cc file

– **Read binary command**
fill data with read binary command on NDEF file

– **Extended Read binary command**
fill data with extended read binary command on NDEF file

– **Update Binary command**
Fill data with update binary command on NDEF file

In case of M24SR request a WTX , this button will automatically manage it. The M24SR will reply with a Window Extension request (that will be displayed in S(WTX) answer array), then the tool will automatically send a S(WTX) request to the M24SR
All this request / answer communication will be displayed in Log window.

Once the command option is selected, the data in I_Block rf frame are filled, you can press the button “send I_Block” to send RF frame.

– **Select & read sequence** button will launch automatically all the procdure and will display it in NDEF file result window (NDEF file can be decoded)

Select NDEF file

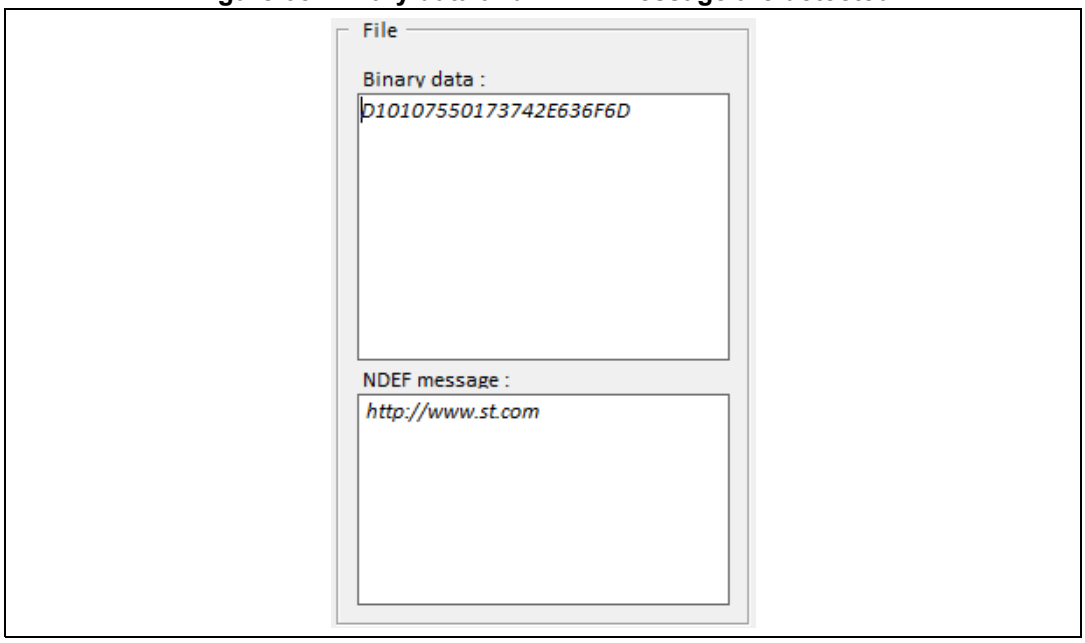
Read NDEFfile length

Read NDEF file data

Display binary data in a field (available only if no error detected)

Display decoded NDEF message if any is in a field (available only if no error detected)

Figure 65. Binary data and NDEF message are detected



- **Commands to manage Password and Access Rights**

Three command can be used to manage Passwords (Read password or Write password).

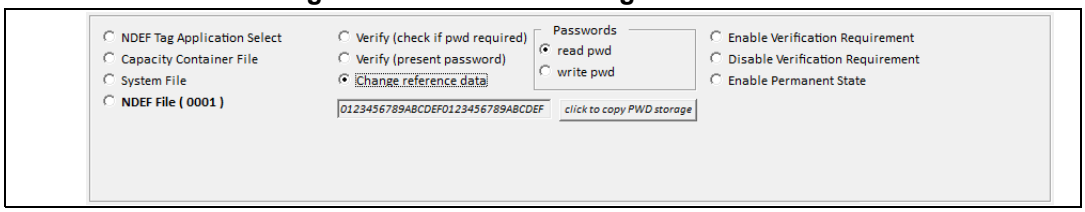
– **Verify (check if password is required)**
fill data with Verify command

– **Verify (present password)**
fill data with Verify command

– **Change reference data (change password value)**
fill data with Verify command

Note: Notes that a NDEF file has to be selected previously (see Datasheet)
The command sent will be applied to selected NDEF file

Figure 66. Password management button

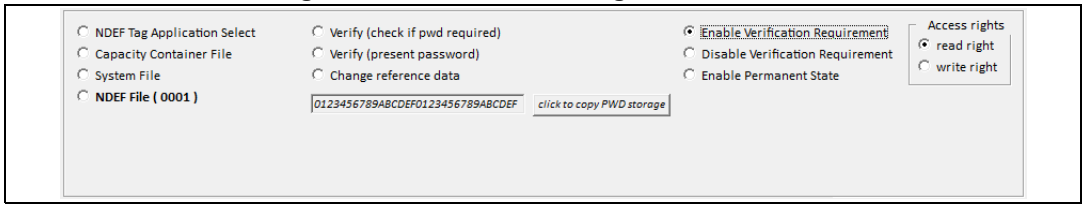


Three commands can be used to manage Access right and M24SR state (see *Figure 66*).

- **Enable Verification requirement**
  fill data with Verify command
- **Disable Verification requirement**
  fill data with Verify command
- **Enable Permanent State**
  fill data with Verify command

Note: Notes that a NDEF file has to be selected previously (see Datasheet)
The command sent will be applied to selected NDEF file

Figure 67. Password management buttons



NDEF Messages management button allows directly access to Type_4A NDEF Message user interface (see *Section 2.5.4*)

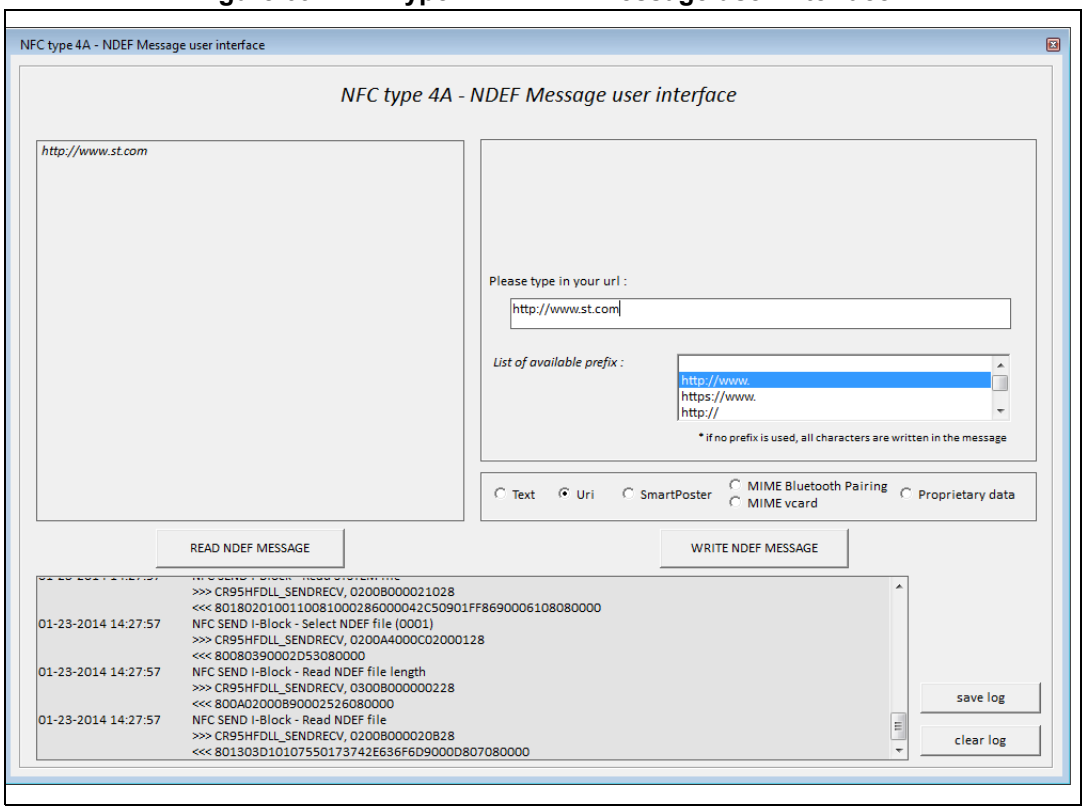
Figure 68. NDEF message management button



2.5.4 NFC Type 4A - NDEF Message user interface

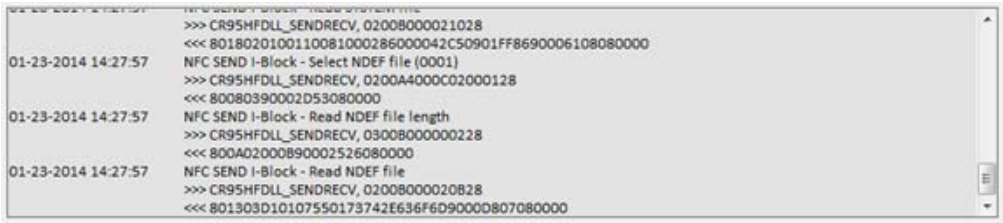
This tool allows to to read or write a NDEF file in a M24SR device

Figure 69. NFC Type 4A - NDEF message user interface



When this tool is selected, the CR95HF is configured as a ISO14443-A reader. See the log window to know the configuration set up.

Figure 70. Log window of configuration setup



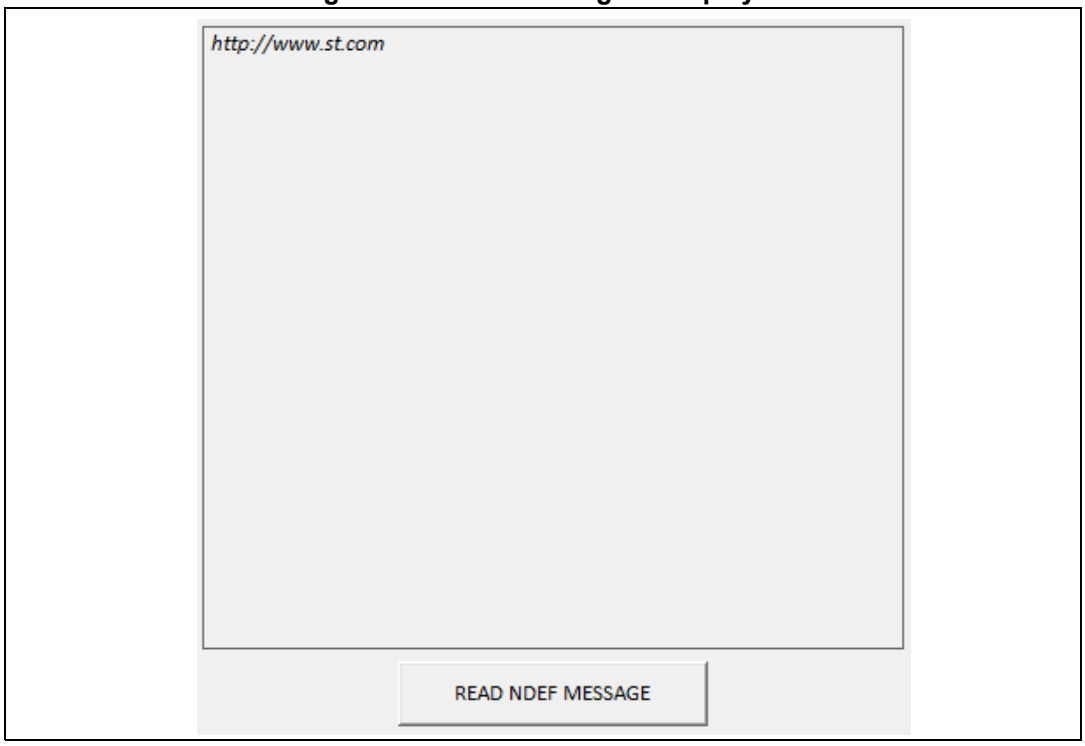
READ NDEF MESSAGE button

The READ NDEF message button is used to launch all the procedure to select the device and read the NDEF message. This whole process is described bellow.

READ NDEF MESSAGE process:

- The RF field is disabled in order to deselect the tag (RF Por).
- The RF fied is enabled.
- The Anticollision sequence is launched (ReqA, Anticol, select, RATS, PPS). The result is that the device is put in the NFC world.
- Select Application launched
- Read CC file process is launched (select, read length, read CC file)
  The goal is to identify NDEF file ID
- Read NDEF file process is launched (select, read length, read NDEF message)
- Decoding of NDEF message
- The available message is displayed on the screen (see *Figure 71*)

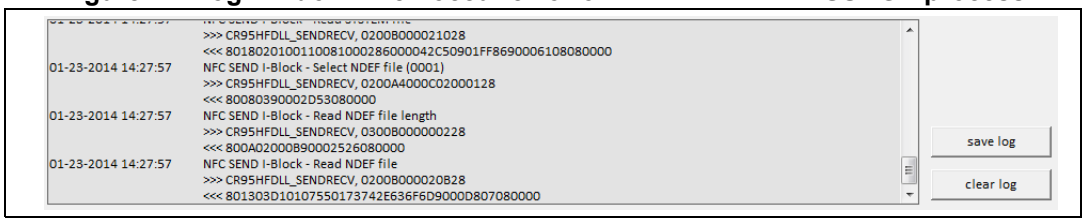
Figure 71. NDEF message is displayed



This process is automatically stopped if any error or “no answer” is detected.

The Log window at the bottom of the screen will help to understand the issue in case of error.

Figure 72. Log window when occur error on READ NDEF MESSAGE process



WRITE NDEF MESSAGE User interface

At the right of the window, you will be able to prepare and write a NDEF message from a list of NDEF message types:

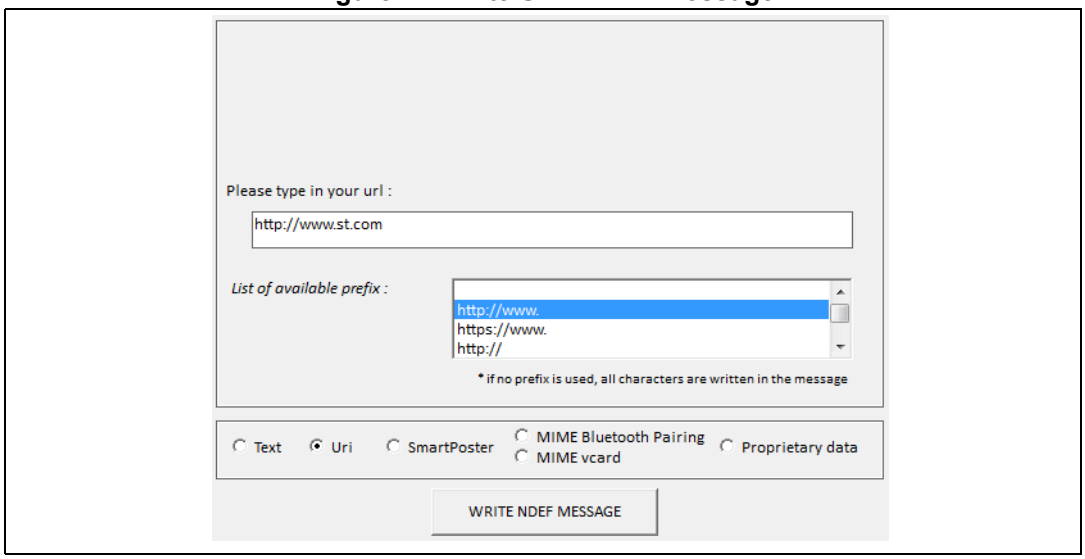
- **Text**

Figure 73. Write Text NDEF message



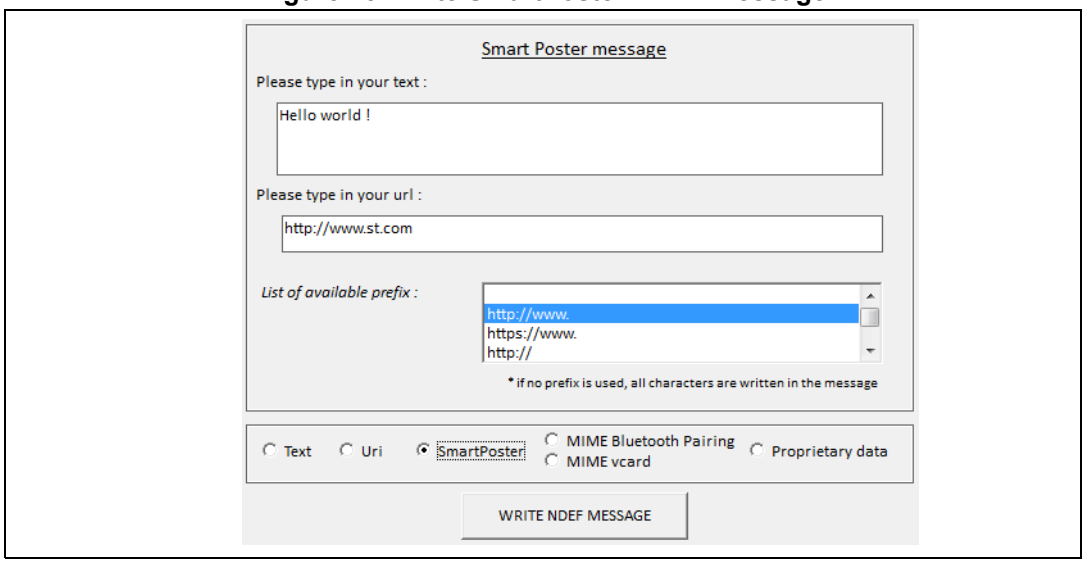
- **URL**

Figure 74. Write URL NDEF message



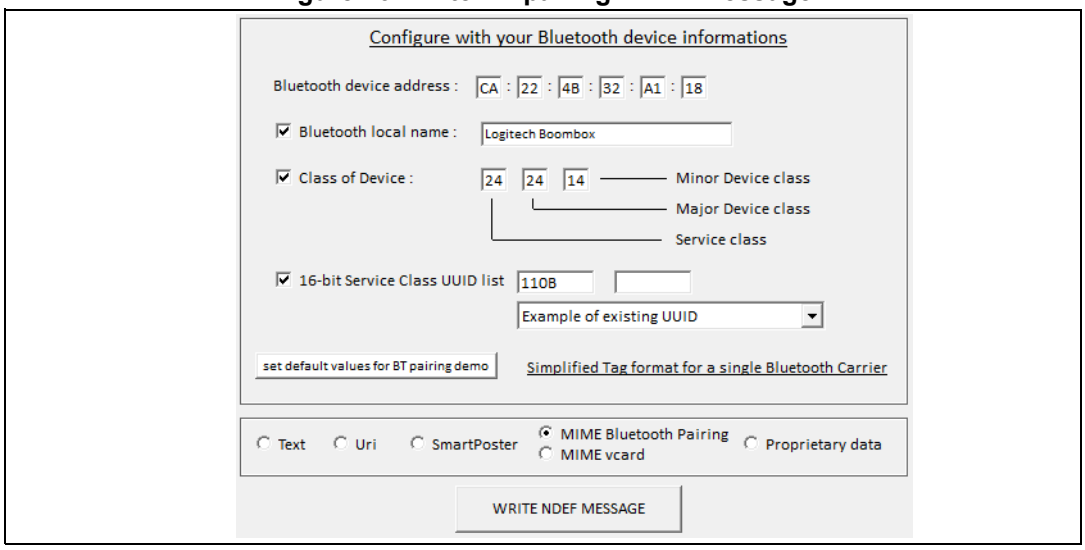
- **SmartPoster**

Figure 75. Write SmartPoster NDEF message



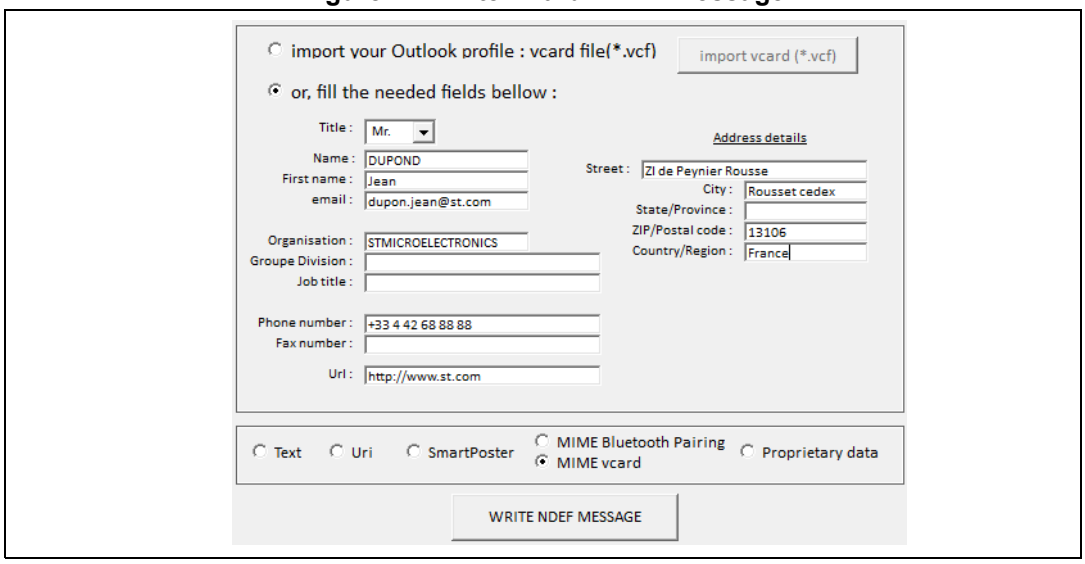
- **MIME Bluetooth pairing**

Figure 76. Write BT pairing NDEF message



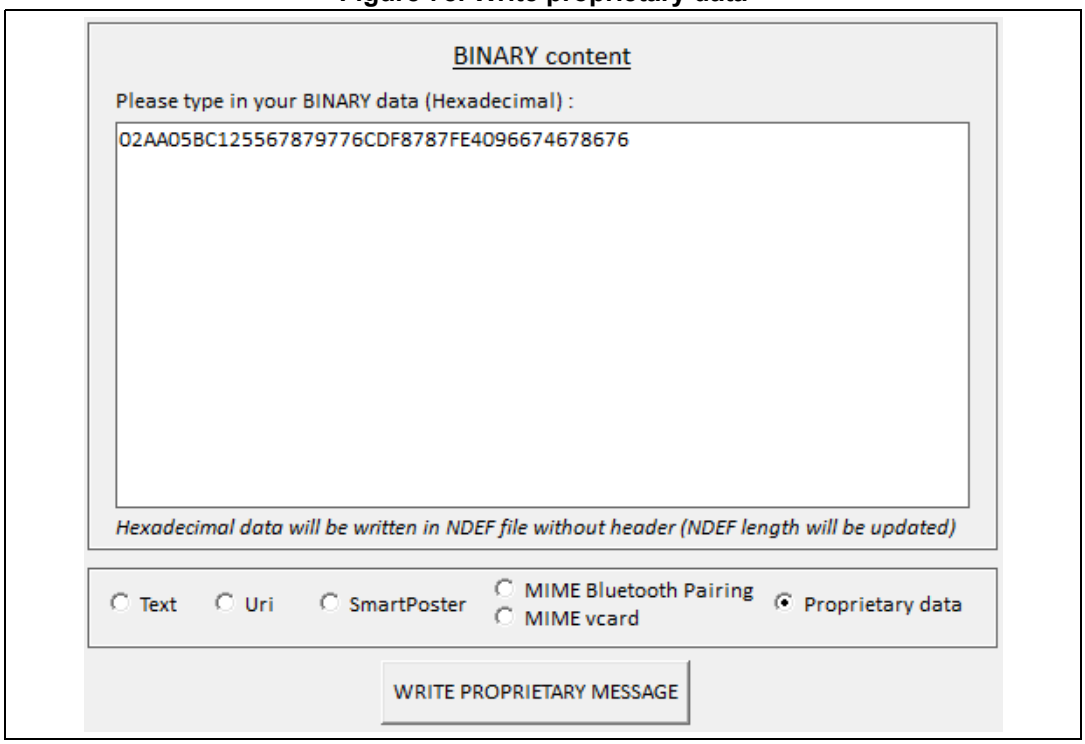
- **MIME vcard**

Figure 77. Write vCard NDEF message



- **Proprietary data** (that is not NDEF message but can be use to fill the memory with hexadecimal data)

Figure 78. Write proprietary data

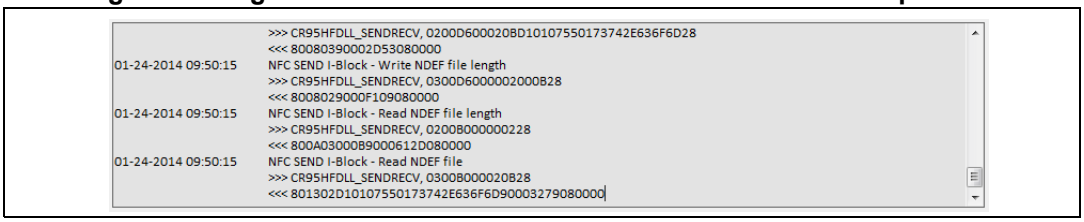


WRITE NDEF MESSAGE process:

- The RF field is disabled in order to deselect the tag (RF Por).
- The RF fied is enabled.
- The Anticollision sequence is launched (ReqA, Anticol, select, RATS, PPS). The result is that the device is put in the NFC world.
- Select Application launched
- Read CC file process is launched (select, read length, read CC file)
  The goal is to identify NDEF file ID
- Write the Encoded NDEF messageThis process is automatically stopped if any error or “no answer” is detected.

The Log window at the bottom of the screen will help to understand the issue In case of error.

Figure 79. Log file when occur error on WRITE NDEF MESSAGE process



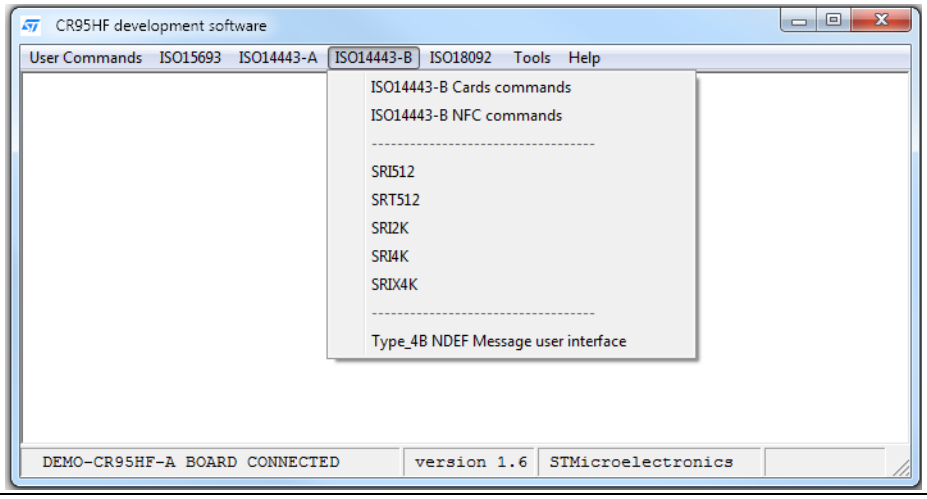
2.6 ISO14443-B menu

This section allows to communicate with ISO14443-B tags.

Select ISO14443-B from the main menu to use the DEMO-CR95HF-A as an ISO14443-B reader. You can then choose between:

- ISO14443-B cards
- SO14443-B with NFC features
- SRIxx & SRT devices

Figure 80. ISO14443-B menu



Select a device from the list (see *Figure 81* and *Figure 82* for an example). This automatically configures the board as an ISO14443-B reader and displays all the ISO14443-B requests.

ISO14443-B communications are configured as follows:

- 106 kbits/s data rate for both transmission and reception
- CRC appended

The ISO14443-B configuration is displayed in the log window.

The upper part of the window contains buttons allowing to send ISO14443-B requests

to tags through the DEMO-CR95HF-A antenna (refer to the device datasheet).

Select the ISO14443-B menu to launch one of the following user interface (see *Figure 82*):

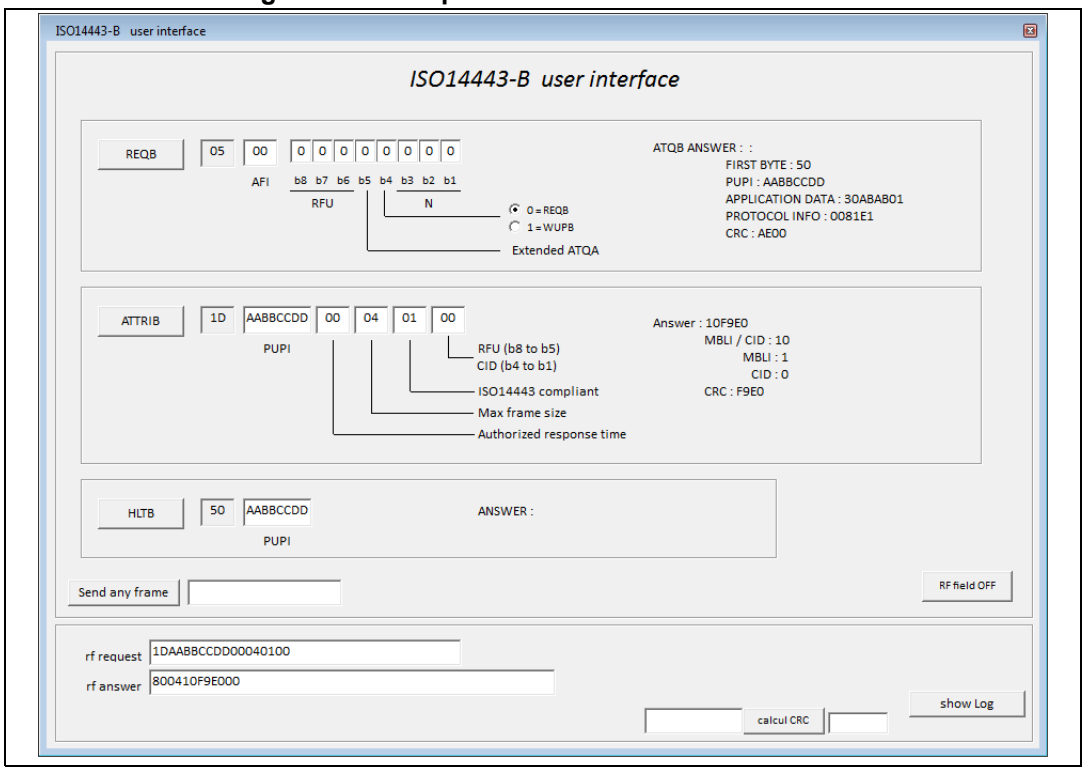
- ISO14443-B Cards commands: (see *Section 2.6.1*)
  This menu allows the user to send any ISO14443-B requests
- ISO14443-B NFC commands: (see *Section 2.6.2*)
  This menu allows the user to send any ISO14443-B requests
- SRI512 SRT512 SRI2K SRI4K SRIX4K (see *Section 2.6.3*)
  This menu allows the user to send any ISO14443-B requests to SRXxx product
- Type_4B NDEF Message user interface (see *Section 2.6.4*)
  This menu allows the user to read and write NDEF message to Tag Type 4B

2.6.1 ISO14443-B Cards commands

This window allows to communicate to any ISO14443-B card.

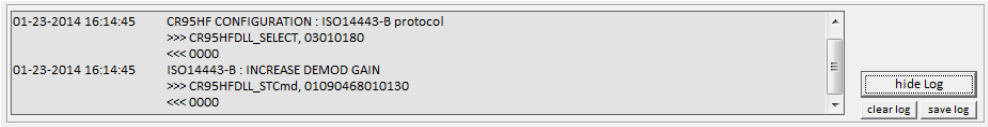
When selecting the ISO14443-B Card commands, the user interface is displayed, as shown in *Figure 82*

Figure 81. Example of ISO14443-B user interface



The protocol selection is launched immediately. The summary of the commands sent to the CR95HF are included in the log window. Click on “show log” to display it (see *Figure 83*)

Figure 82. Log file



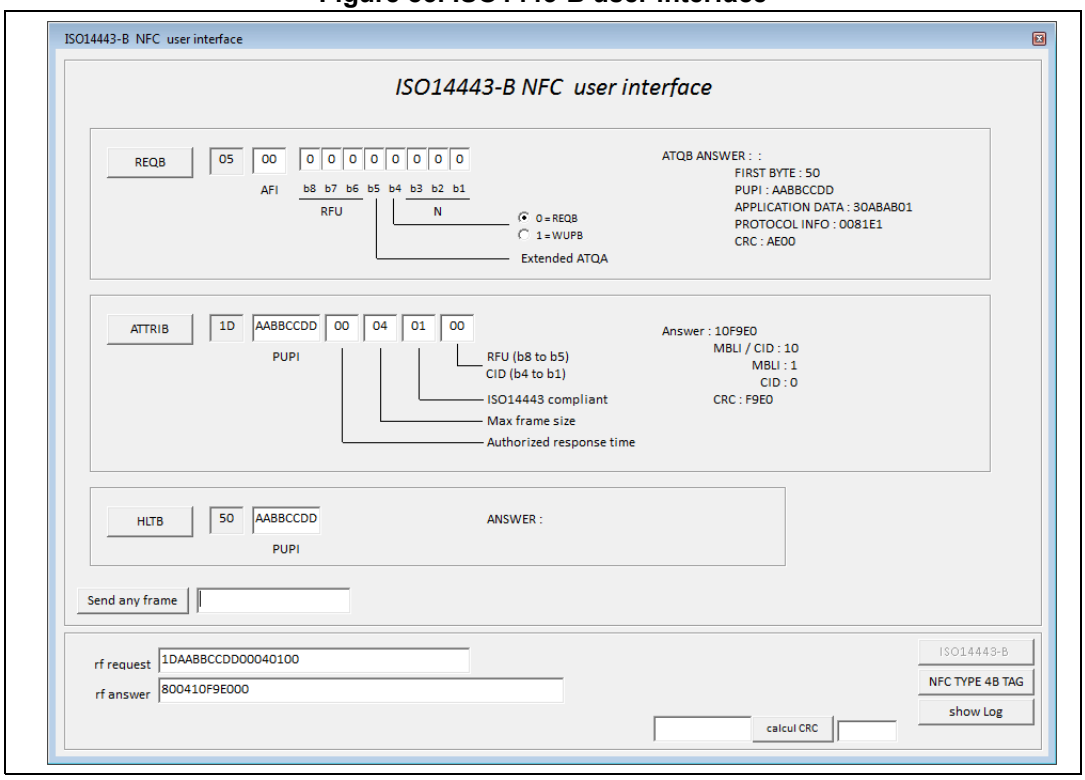
Some basic commands are available to be able to play with TOPAZ cards such as:

- REQB
- WPUB
- ATTRIB

Log window can be displayed by clicking on “Show log” button.

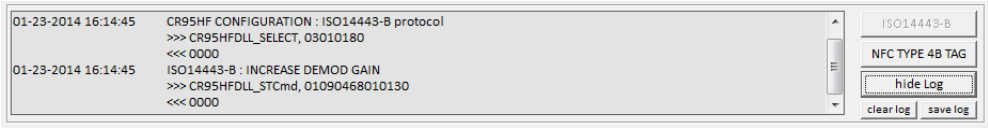
2.6.2 ISO14443-B NFC commands

Figure 83. ISO1443-B user interface



The protocol selection is launched immediately. The summary of the commands sent to the CR95HF are included in the log window. Click on “show log” to display it (see *Figure 83*)

Figure 84. Protocol select for ISO14443-B



This screens allow to send ISO14443-A commands:

- REQB
- WUPB
- ATTRIB

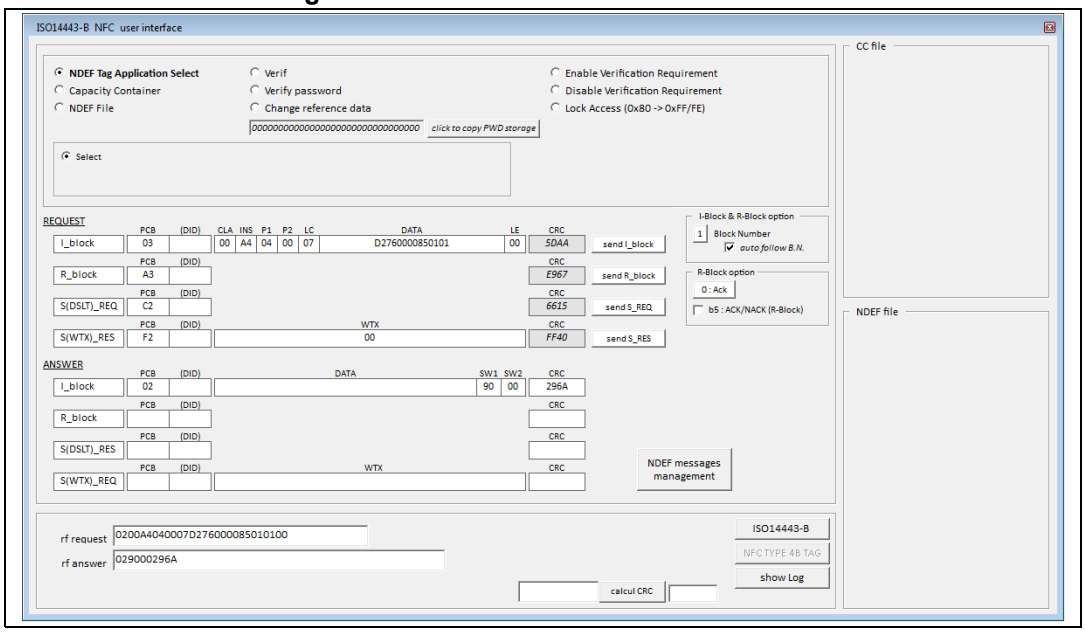
REQB & ATTRIB commands are mandatory to put the ISO14443-B NFC card into NFC world.

As soon as this commands have been sent successfully, you will be able to send NFC commands.

This commands are available on a second window. To show this window, please click on NFC TYPE 4B TAG button.

This window will allows to send NFC APDU in order to play with the NFC Type 4B tag.

Figure 85. ISO14443-B NFC user interface

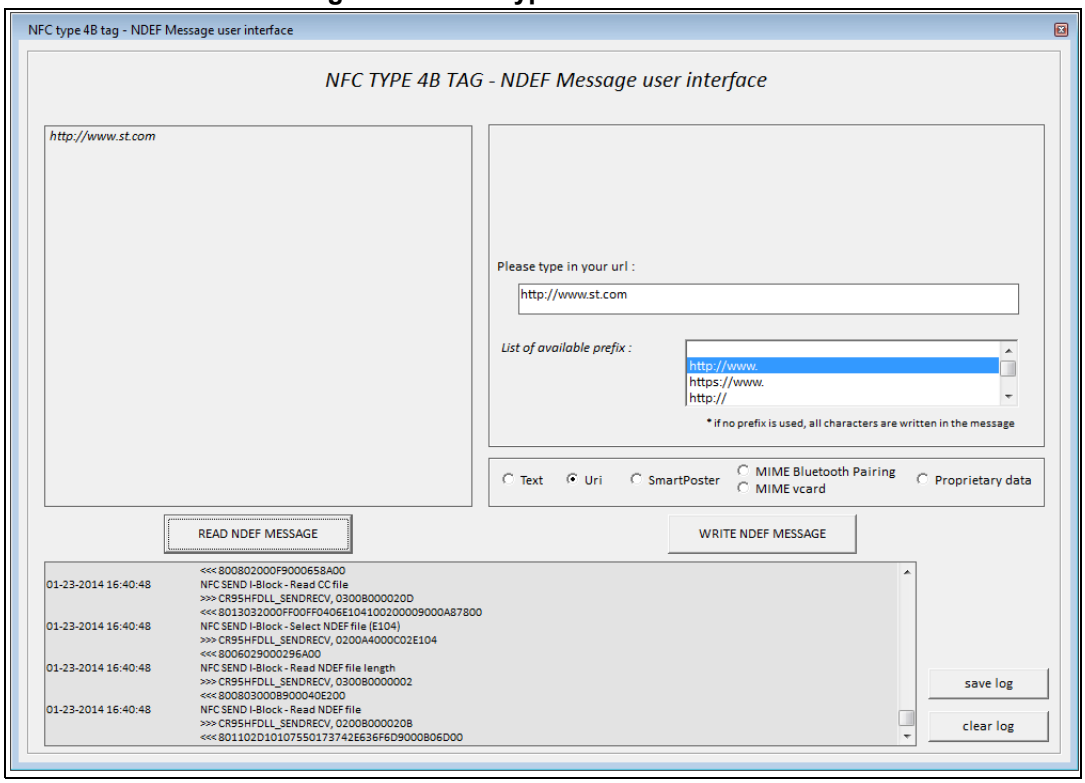


For more informations about the use of each button, please refers to *Section 2.5.3*.

2.6.3 Type_4B NDEF Message user interface

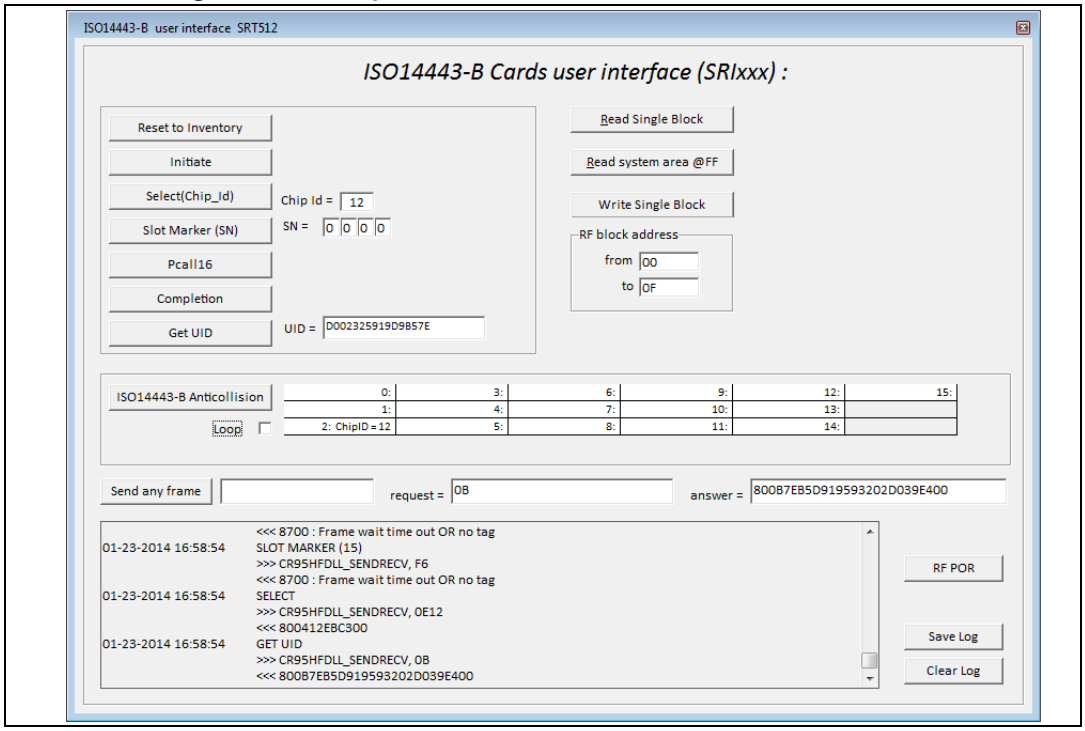
The functionality of this tool is the same as the NFC TYPE 4A TAG that can be found in ISO14443-A (see to *Section 2.5.4* for more informations about how to use it).

Figure 86. NFC Type 4B user interface



2.6.4 SRIxx/SRTxx products

Figure 87. Example of ISO14443-B user interface for SRIxxx



The ISO14443-B configuration is displayed in the log window as shown in figure.

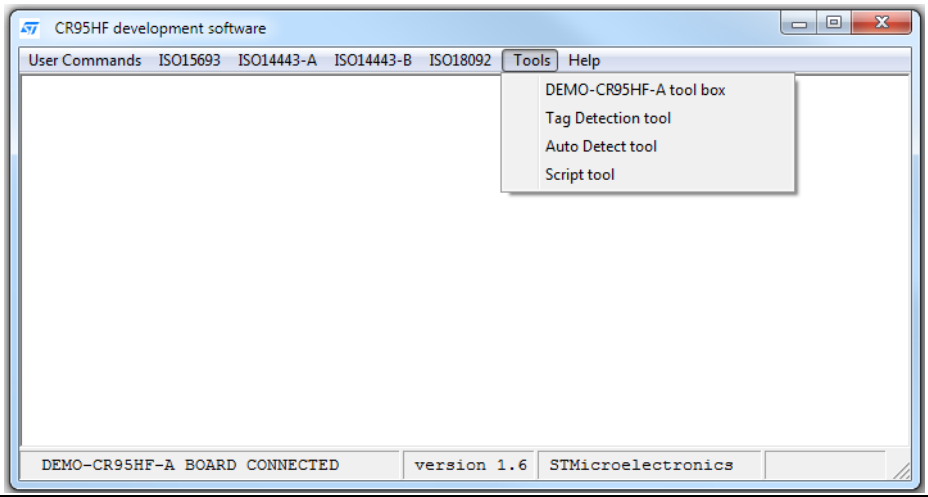
The window allows to send all the command of the datasheet for this products :

- Reset to Inventory
- Initiate
- Select
- Slot Marker
- Pcall16
- Completion
- Get UID
- Read Single Block
- Read System area (address 0xFF)
- Write Single Block
- A single button allows to launch all ths Anticollision sequence.

2.7 ISO18092 menu

1. Select ISO18092 from the main menu to use the DEMO-CR95HF-A as an ISO18092 reader (see *Figure 88*).

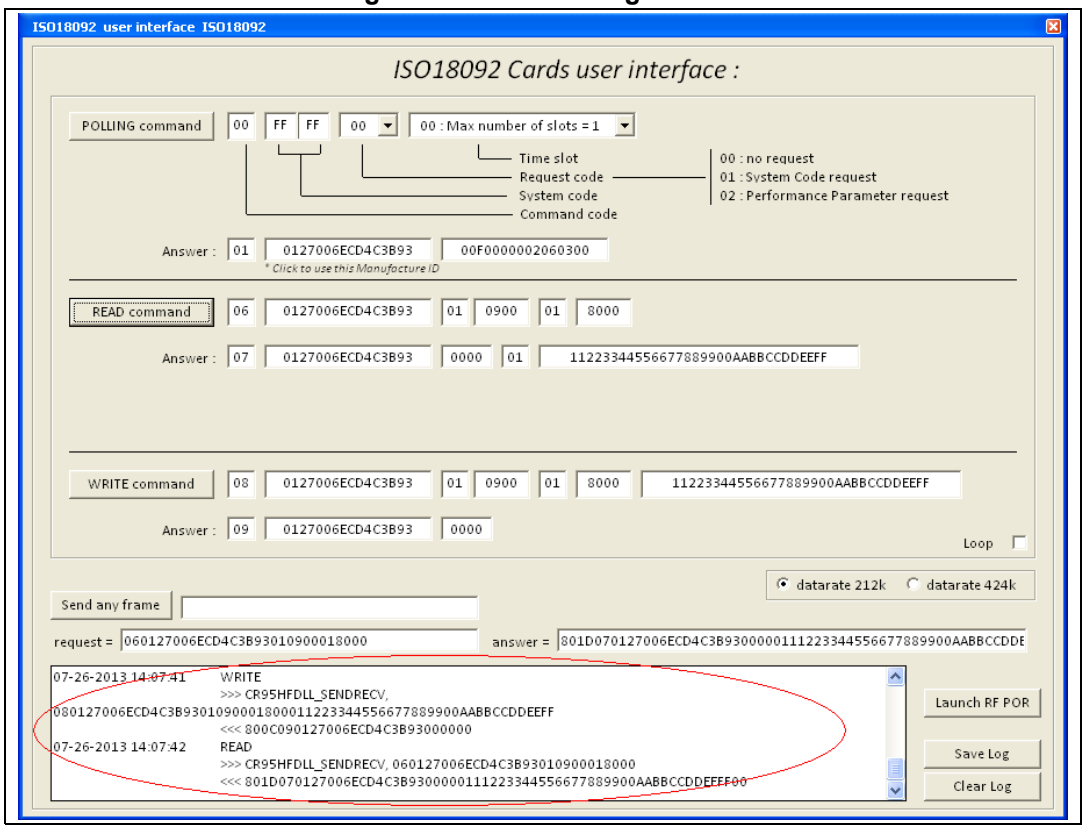
Figure 88. ISO18092 menu



2. Select ISO18092 Cards commands from the list. This automatically configures the board as an ISO8092 reader and displays all the ISO18092 requests.

The ISO18092 configuration is displayed in the log window as shown in *Figure 89*.

Figure 89. ISO18092 log window



Polling command can be done to communicate with an ISO18092 card. The response of the tag will be displayed in several fields.

ManufactureID is displayed in the second field. Click on this field to fill the Read & Write commands with this mandatory field.

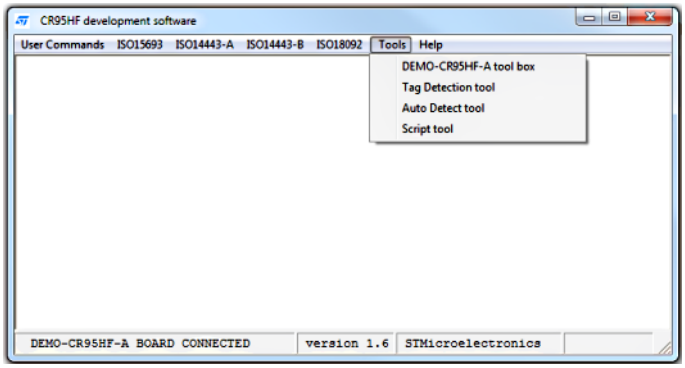
Read command and Write command are also available.

2.8 Tools menu

Select the **Tools** menu to launch one of the following tools (see *Figure 90*):

- **DEMO-CR95HF-A tool box** (see *Section 2.8.1: DEMO-CR95HF-A toolbox*)
  This menu allows the user to send requests to the DEMO-CR95HF-A board.
- **Tag Detection tool (**see *Section 2.8.2: Tag Detection tool*)
  This menu can be used to launch a DEMO-CR95HF-A calibration and a CR95HF Tag Detection.
- **Auto Detect tool** (see *Section 2.8.3: Auto detection tool*)
  This menu allows to launch successive anticollision processes on several RFID technologies in order to detect tags
- **Script tool (**see *Section 2.8.4: Script tool*)
  This menu allows to transmit and execute a sequence of CR95HF requests.

Figure 90. Tools menu

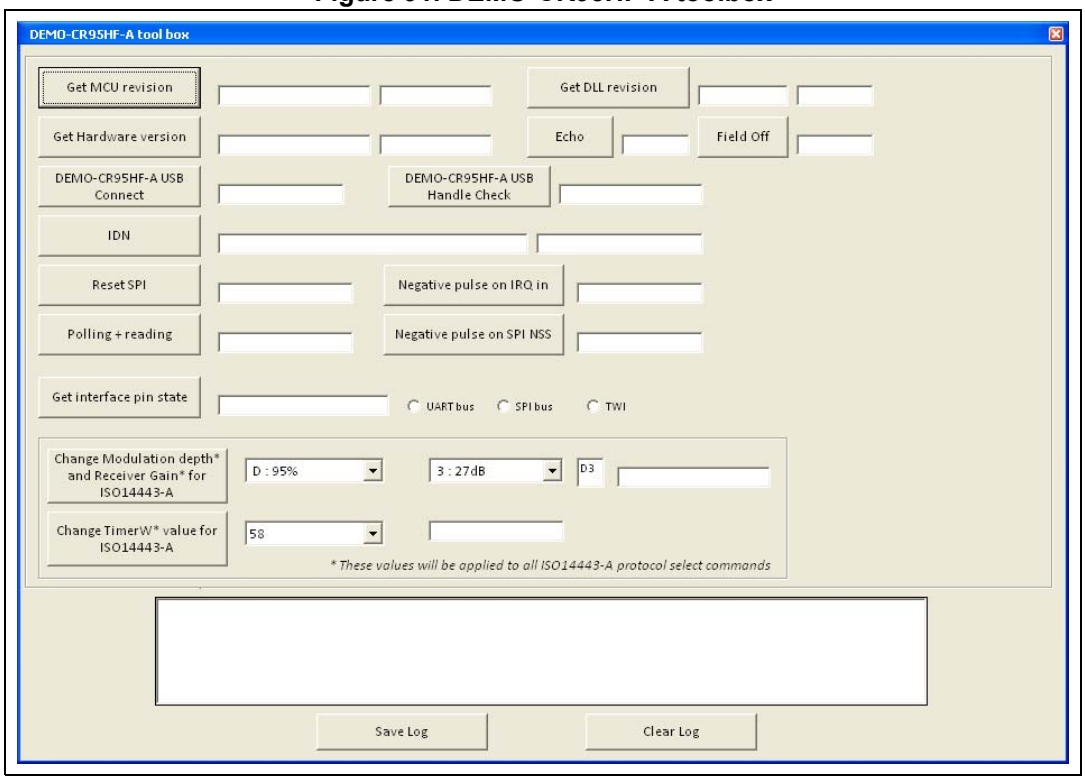


2.8.1 DEMO-CR95HF-A toolbox

The DEMO-CR95HF-A toolbox allows to send the following requests to the DEMO-CR95HF-A board (see *Figure 91*):

- **Get MCU revision**: reads the revision of the STM32 microcontroller firmware.
- **Get DLL revision**: reads the revision of the DLL installed on your PC.
- **IDN**: sends an IDN command to the CR95HF and receives the answer.
- **Field Off**: turns the RF field off.
- **Echo**: sends an Echo command to the CR95HF and receives the answer.
- **Reset SPI**: resets SPI communications between the STM32 MCU and the CR95HF.
- **Negative pulse on IRQ in**: applies a negative pulse on the CR95HF IRQ input.
- **Negative Pulse on SPI NSS**: applies a negative pulse on CR95HF NSS pin.
- **Polling + reading**: puts the CR95HF in polling & reading mode.
- **Get interface pin state**: detects the bus configuration of the DEMO-CR95HF-A board.
- **Change Modulation depth and Receiver Gain**: modifies the setting for ISO14443-A.
- **Change TimerW value**: modifies the setting for ISO14443-A.

Figure 91. DEMO-CR95HF-A toolbox



2.8.2 Tag Detection tool

Two commands are available (see *Figure 92*):

- **Calibration**

  Clicking the **Calibration** button performs a DEMO-CR95HF-A calibration to determine the DacDataL/DacDataH parameters that will be used in Tag Detection mode. The calibration sequence is the following:

  a) Send an Idle command to the CR95HF with DacDataL fixed to 0 and DacDataH set to its maximum value.

  b) Read the Wakeup register to check whether the CR95HF has entered Wakeup mode on a tag detection event. Otherwise, a new Idle command is sent with a lower DacDataH value. These steps are repeated until a tag is detected.

  The DacDataL/DacDataH parameters that will be used for tag detection are:

  $DacDataL_{Tag\ detection} = DacDataL_{Calibration} - 2$

  $DacDataH_{Tag\ detection} = DacDataH_{Calibration} + 2$, $DacDataH_{Calibration}$ being the value corresponding to the detection limit.

- **Tag Detection**

  The tag detection sequence is performed using the $DacDataL_{Tag\ detection}$/$DacDataH_{Tag\ detection}$:

  a) Send an Idle command to put the CR95HF in tag detection state.

  b) Wait till the CR95HF wakes up: read the Wakeup register to check if the CR95HF has been woken up by a tag detected in the RF field or by timeout.

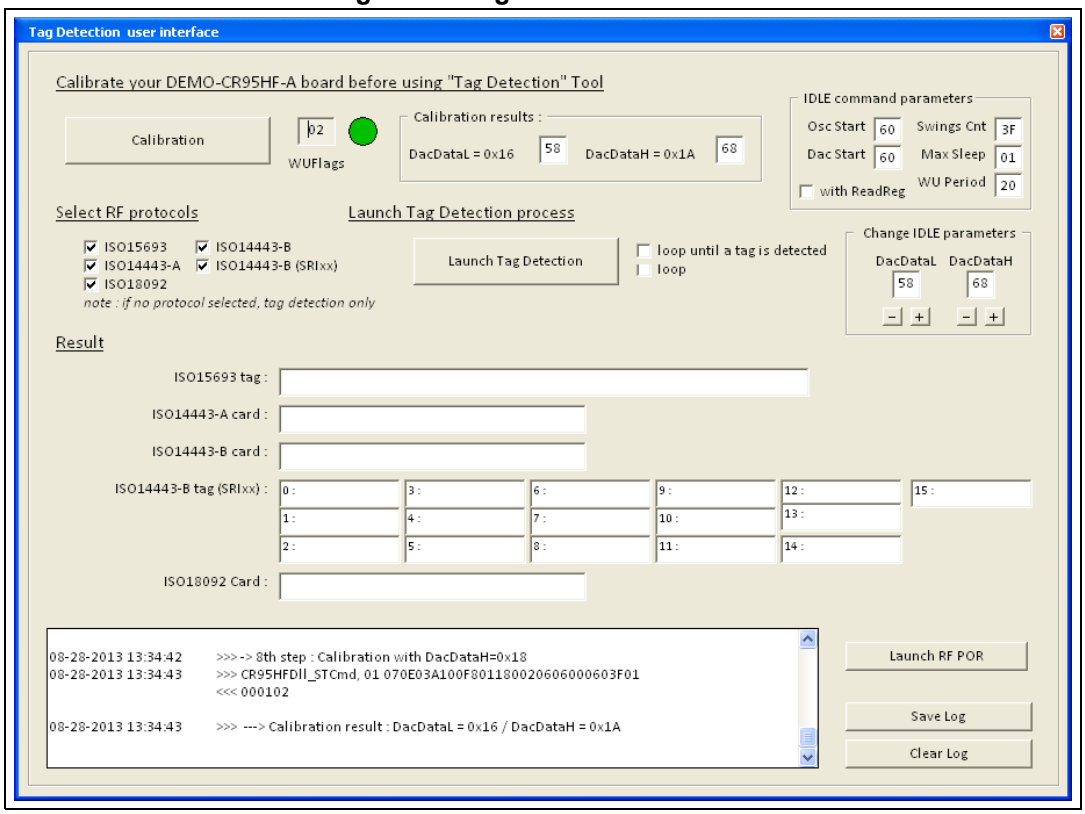
  If a tag is detected in the DEMO-CR95HF-A field, the CR95HF enters Wakeup mode, and an ISO15693/ISO14443-B anti-collision procedure starts to identify the tags present in the field.

  To perform one-shot tag detection, uncheck both **Loop** and **Loop until a tag is detected**, before pressing the **Tag Detection** button.

  If only **Loop** is checked, the tag detection runs continuously and stops when **Loop** is unchecked.

  If only **Loop until a tag is detected** is checked, the tag detection runs continuously and stops when a tag is detected and identified.

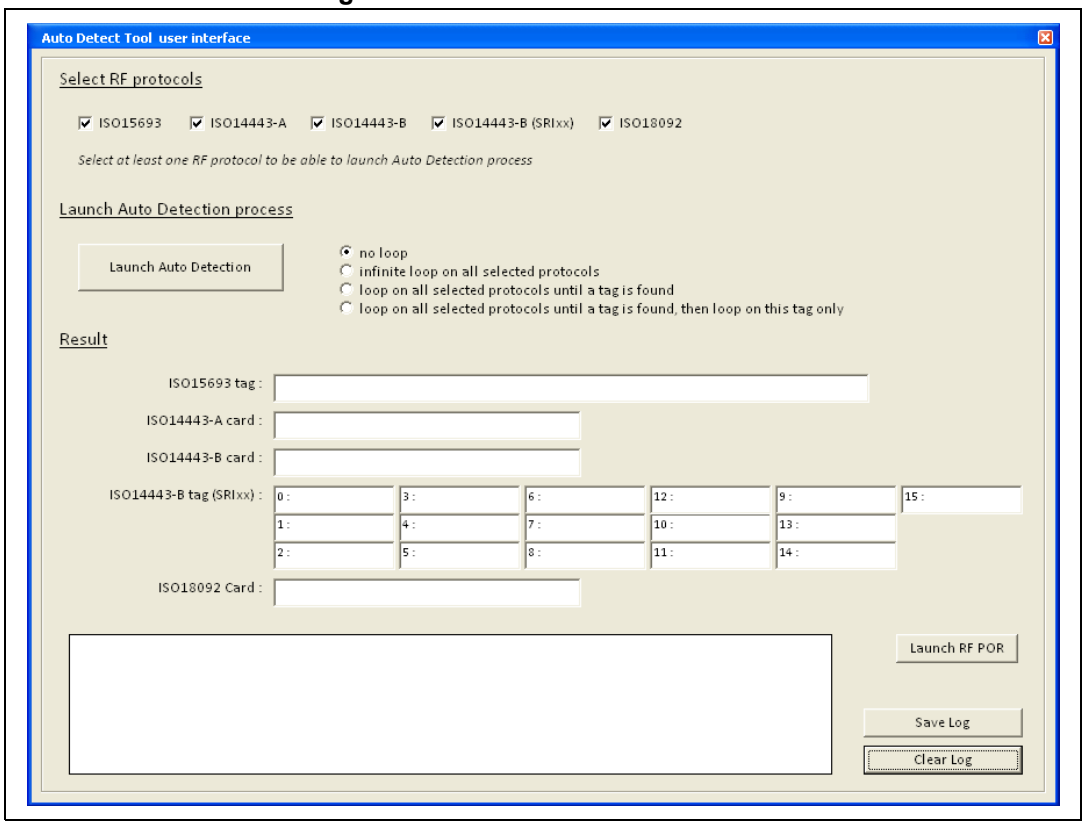
Figure 92. Tag detection interface



2.8.3 Auto detection tool

The Auto detection tool allows to play a tag hunt on several RFID technologies (see *Figure 93*).

Figure 93. Auto Detect tool interface



- **Select RF protocols**
  By selecting one or more RF protocol, you can define which kind of tag will be detected and on which protocol the tag hunt will be launched.
- **Launch Auto Detection process**
  The Launch Auto Detection button allows to launch a tag hunt on a selected process. This can be done once. The Loop option can be selected.
- **Result**
  In case of a Tag detection, the result field will be the field with the Tag identification.

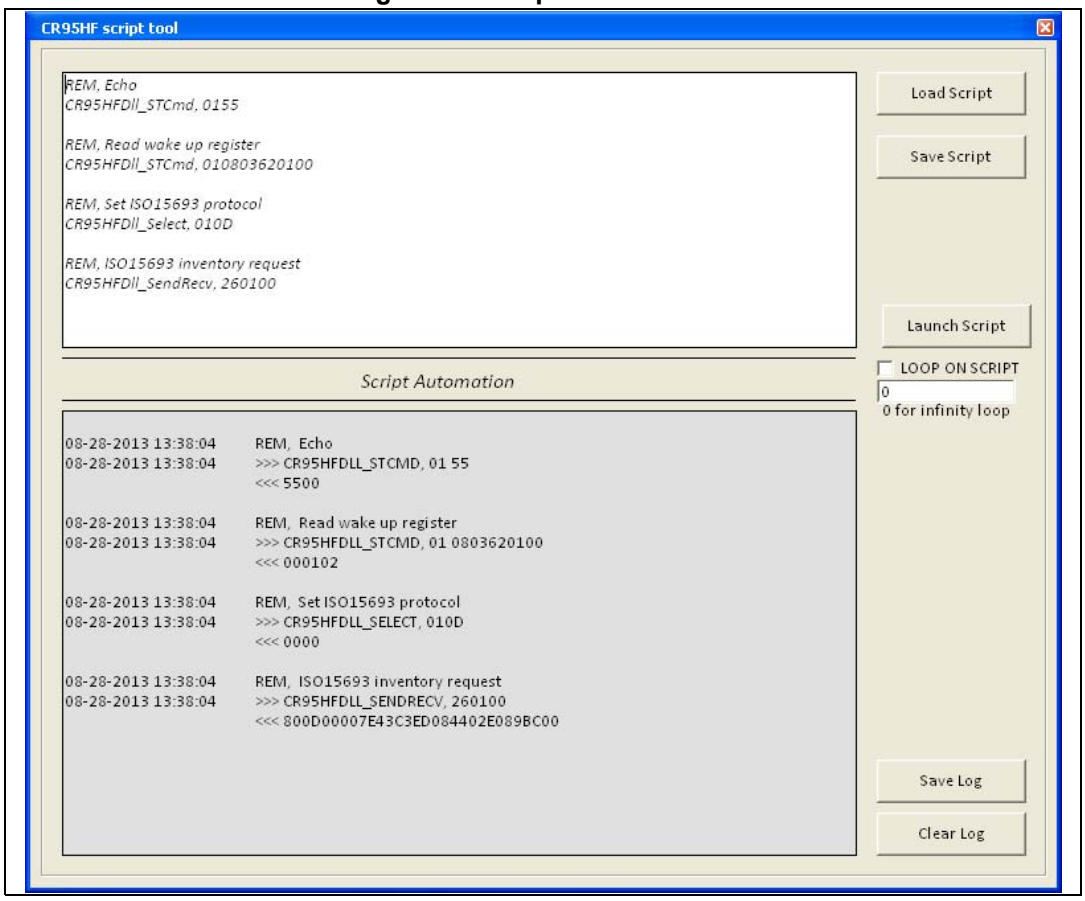
2.8.4 Script tool

The **Script** tool allows playing a script containing a sequence of CR95HF commands (see *Figure 94*). The following functions are available:

- **Save Script** saves the script in a text file.
- **Load Script** loads a script file
- **Launch Script** runs the script. The script is executed until an error occurs. Read the log to identify the cause of the error and correct your script. This can be due to a syntax error. Refer to the Script Help to correct it.

The Script Help (see *Section 2.9: Help menu*) describes the syntax of all the commands that can be sent to the DEMO-CR95HF-A.

Figure 94. Script tool interface



2.9 Help menu

Select the **Help** menu to access the following functions (see *Figure 95*):

- **Change background color**

  This function changes the color of the main window. Once set, the background color is saved and recalled each time the software is used (see *Figure 96*).

- **Script Help**

  This function allows to get information on CR95HF function syntax (see *Figure 97*). It is particularly useful when developing a script (see *Section 2.8.4: Script tool*).

- **About ...**

  Click **About ...**to get information on the CR95HF development software (see *Figure 98*).

Figure 95. Help menu

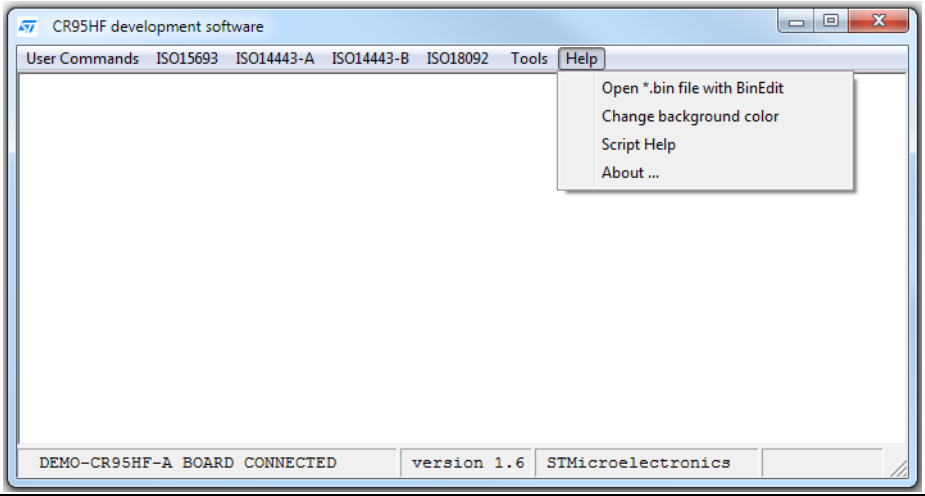


Figure 96. Change background color menu



Figure 97. Script help

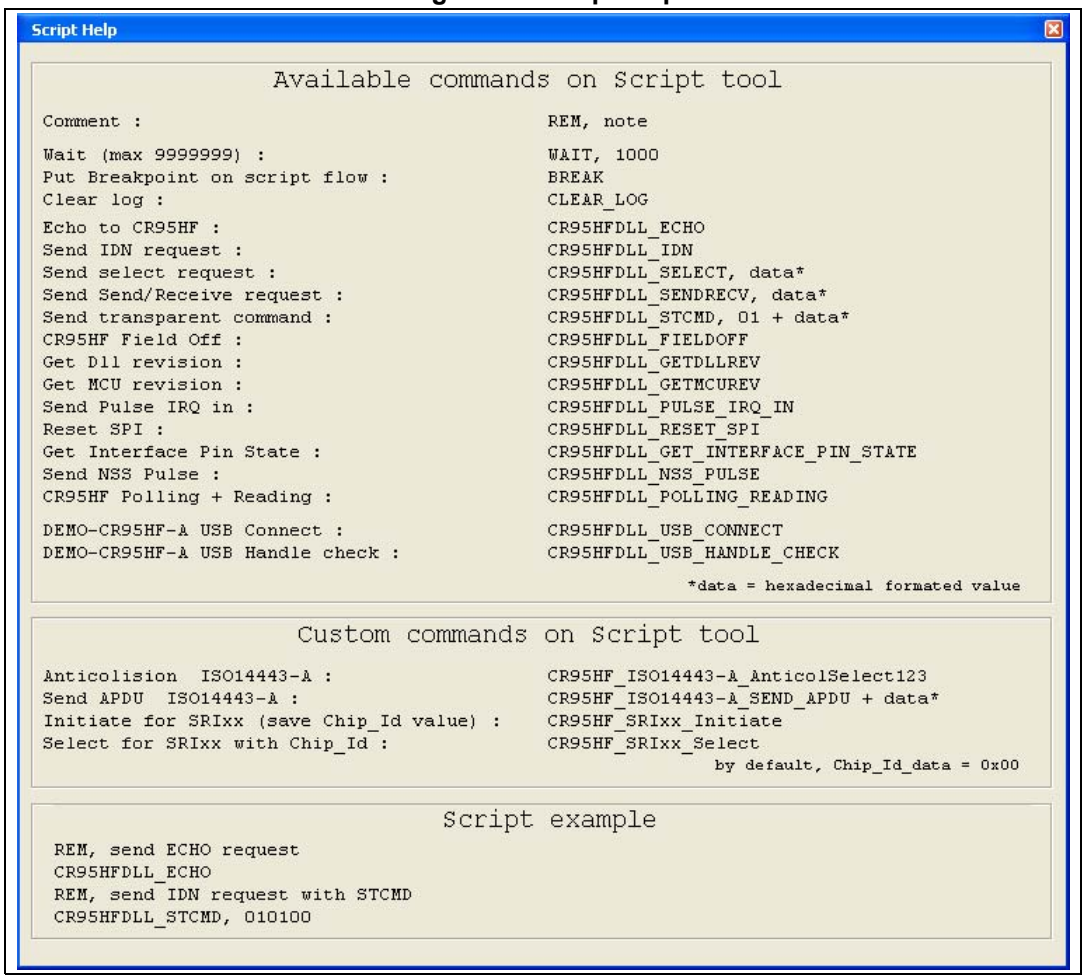
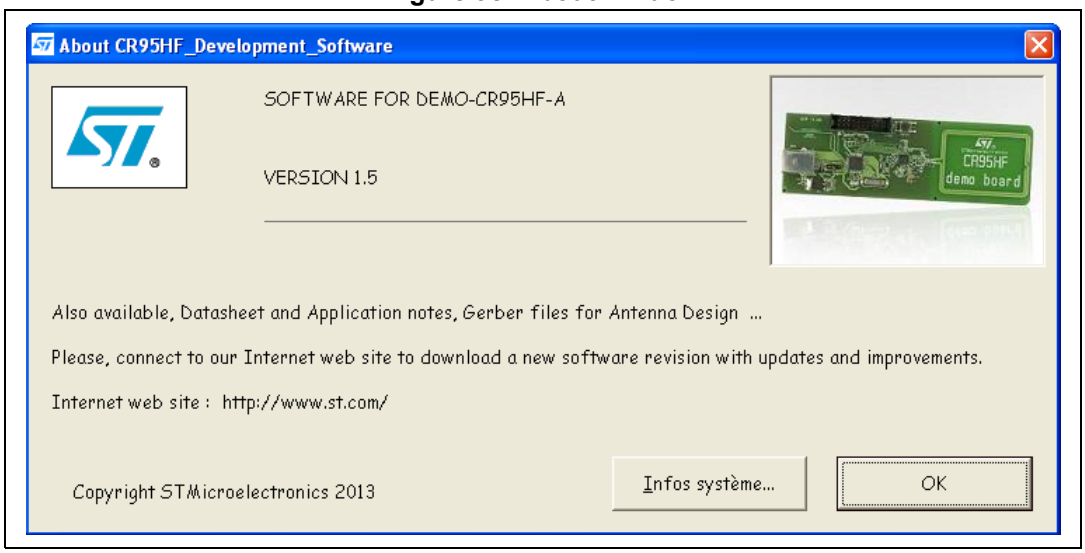


Figure 98. About window



2.10 Log window

The log is displayed at the bottom of each window. It contains all the requests sent to the DEMO-CR95HF-A through the USB interface. The log contains the following information:

- Date and hour when the command has been sent.
- Request and parameters sent to the DEMO-CR95HF-A: name of the command sent to the board through the DLL, followed by all parameters in hexadecimal format.
- Answer from the CR95HF.

The command and parameter formats are compatible with the Script tool (see *Section 2.7: ISO18092 menu*) and can be directly copied in a script file.

As an example, the log contains the information shown in *Figure 99* when an Idle command is sent to the board. In this example:

'CR95HFDll_STCmd 01 070E092200380018002060606 4743FFF' means that:

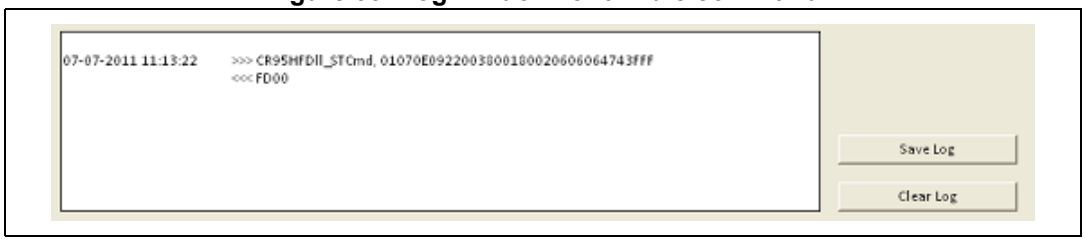
– The CR95HFDll_STCmd request has been sent to the DEMO-CR95HF-A.

– '01' is the header of CR95HFDll_STCmd command.

– '070E092200380018002060606 4743FFF' corresponds to an Idle command followed by its parameters.

'FD00' is the answer from the DEMO-CR95HF-A board.

Figure 99. Log window for an Idle command



3 Revision history

Table 1. Document revision history

Date	Revision	Changes
12-Jul-2011	1	Initial release.
28-Oct-2011	2	Changed document title. Updated disclaimer on last page.
12-Sep-2013	3	Updated the title and the *Introduction* for RPN consistency. Added *Section 2.7: ISO18092 menu* and *Section 2.6: ISO14443-B menu*. Extended the list of *Section 2.8.1: DEMO-CR95HF-A toolbox*. Added *Section 2.8.3: Auto detection tool*. Updated several software figures (*Figure 13*, *Figure 17* to *Figure 22*, *Figure 24* to *Figure 41* ...) Added *Figure 81: Example of ISO14443-B user interface*.
25-Feb-2014	4	Updated *Section 2.3: User commands on page 13*, added *Figure 14: User command menu* Added new *Section : 09: WrReg on page 20* with new *Figure 26*. Added new *Section 2.3.2: RX95HF commands menu on page 21* with new figure from *Figure 31* to *Figure 40*. Added new *Section 2.5* and *Section 2.6* with new figures from *Figure 44* to *Figure 87* Updated *Figure 13*, *Figure 41*, *Figure 88*, *Figure 90* and *Figure 95*

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